20th Annual

Fred Scott Feline Symposium

July 25–27, 2008

Cornell University
College of Veterinary Medicine

Photo by Alexis Wenski-Roberts.

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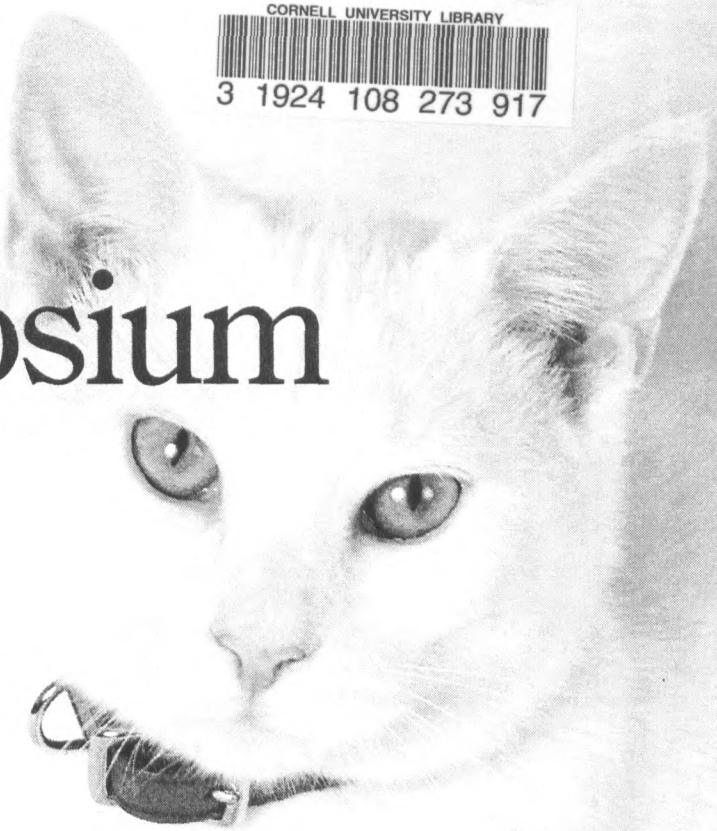

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Information about this conference and other continuing education programs offered by the College of Veterinary Medicine at Cornell University are available by contacting:

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General Information and Logistics

20th Annual Fred Scott Feline Symposium
July 25-27, 2008

Course Overview

This year's 20th Annual Fred Scott Feline Symposium will educate and update veterinarians in feline neurology, kitten care and training, feline respiratory diseases, and other timely topics.

Accreditation and Continuing Education Credit

The College of Veterinary Medicine at Cornell University accredits this symposium for a maximum of 17 hours of continuing education credit. Each attendee should claim only those hours of credit that he/she actually spends in the educational lectures. You are asked to sign-in at the registration desk on the first day so that there is evidence of your attendance.

For questions about accreditation and continuing education credit please contact:

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Evaluation

It is important for the Cornell Office of Continuing Education, faculty, corporate sponsors, and exhibitors to receive your feedback. We ask that you complete the evaluation form and return it to the registration desk before you leave the symposium. The information you provide us is essential in the development of future educational programs. We welcome and encourage your comments on all aspects of this symposium.

Certificate of Participation

You will receive a certificate of participation, which will be available at the registration desk during lunch on Saturday, July 26. The certificate verifies your attendance at the 20th Annual Fred Scott Feline Symposium.

Meals

Meal tickets are in the back of your nametag for:

- Lunch on Friday and Saturday. These lunch meal tickets are to be turned into the cafeteria cashier after you select your lunch on Friday and at the cafeteria entrance on Saturday.
- Lunch with Steve Dale on Friday: If you signed up to have lunch with Mr. Dale on Friday please turn in your ticket to the staff member at the meeting room entrance.

Tours

If you registered to participate in a tour of the college during lunch on Friday or Saturday you will find an admittance ticket in the back of your nametag. Please meet in the Atrium at the beginning of your lunch break.

Course Materials

The course materials that are distributed during this symposium are under the auspices of the Office of Continuing Education at the College of Veterinary Medicine at Cornell University. Duplication of these materials is prohibited.

Disclaimer

The lectures offered during this symposium will include some discussion of off-label use and commercial products and/or services. The opinion and recommendations expressed by the faculty are their own.

Agenda

Agenda

20th Annual Fred Scott Feline Symposium
July 25-27, 2008

- All lectures will be held in Lecture Hall I in the Veterinary Education Center.
- Continental Breakfasts and breaks will be located in the Hagan Room.

Friday, July 25, 2008

7:30 - 8:00 am	Registration Continental Breakfast SPONSORED BY MERIAL
8:00 - 8:15	Welcome - *Fred Scott*
8:15 - 9:15	Brain Dead Fat Cats: Why We Must Enrich Our Cats' Lives *Steve Dale*
9:15 - 9:30	Break
9:30 - 10:30	Cats Are the Rodney Dangerfield of Pets *Steve Dale*
10:30 - 10:45	Break
10:45 - 12:15 pm	Kitty K: A Kittens Brain is a Terrible Thing to Waste - Socializing Kittens *Steve Dale*
12:15 -1:30	Lunch in the Cafeteria
1:30 - 2:20	Tribute to Dr. Jean Holzworth *Fred Scott*
2:20 - 2:30	Special Award for Outstanding Support of Shelter Medicine Presented to Dr. Gerryll Hall of the Schering Plough Corporation Awarded by the Association of Shelter Veterinarians in recognition and appreciation of her continuous and dedicated efforts to support and advance the field of shelter medicine. *Brenda Griffin*
2:30 - 2:45	Break
2:45 - 4:15	Selected Neurological Disorders in Cats *Curtis W. Dewey*
4:15 - 4:30	Break
4:30 - 5:30	Partners in Animal Health: How Cornell's New Educational Outreach Program Can Help Your Practice *Jodi Korich*
6:30 - 9:00	**Annual Picnic** at the Six Mile Creek Vineyard Maps at the registration desk.

Saturday, July 26, 2008

7:30 - 7:45 am	Continental Breakfast SPONSORED BY IDEXX LABORATORIES, INC.
7:45 - 8:45	Feline Herpes Virus - Clinical Syndromes and Diagnostic Testing *David Maggs* SPONSORED BY SCHERING-PLOUGH ANIMAL HEALTH
8:45 - 9:00	Break
9:00 - 10:00	Feline Herpes Virus - The Latest in Antiviral Therapy *David Maggs* SPONSORED BY SCHERING-PLOUGH ANIMAL HEALTH
10:00 - 10:15	Break
10:15 - 12:15 pm	Nasal Discharge and Sneezing in the Cat *Lynelle Johnson*
12:15 - 1:00	Lunch in the Cafeteria SPONSORED BY SCHERING-PLOUGH ANIMAL HEALTH
1:00 - 2:00	The Coughing Cat *Lynelle Johnson*
2:00 - 2:15	Break
2:15 - 3:15	The Coughing Cat (continued) *Lynelle Johnson*
3:15 - 3:30	Break
3:30 - 4:30	Management of Respiratory Distress *Lynelle Johnson*

Sunday, July 29, 2007

8:00 - 8:30 am	Continental Breakfast
8:30 - 10:00	CATalyst for Change...for the Future of Cats! *Jane Brunt*
10:00 - 10:15	Break
10:15 - 11:45	Virulent Systemic Feline Calicivirus Update *John Parker*

Corporate Sponsors and Exhibitors

20th Annual Fred Scott Feline Symposium
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IDEXX is a worldwide leader in innovative products and services for veterinary, food and water applications. Our companion animal and equine businesses combine biotechnology with medical devices and information technology to support veterinarians' efforts in providing excellent care while building successful practices. Our food and water businesses employ efficient technologies for livestock/poultry monitoring and ensuring the safety of public water and milk.

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At Nutro Products we have more than 80 years of experience creating great-tasting, nutritious pet foods. We understand that your pets aren't just companions–they're important members of your family. That's why we've created premium pet foods made from quality ingredients for every life stage.

Annual Picnic

The annual picnic will be held at the Six Mile Creek Vinyard and includes a wine tour for those who are interested. Wines served at the picnic are from Six Mile Creek Vinyard and the vineyard is offering our guests a 20% discount on wine purchases.

Exhibitors

Cornell Feline Health Center

Elsevier/Saunders

Hill's Pet Nutrition

IDEXX Laboratories

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Faculty

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Jane E. Brunt, DVM

Dr. Jane Brunt has practiced feline-exclusive medicine in Maryland for over twenty years. Her practice philosophy of striving for excellence, providing compassionate care with empathy and courteous service while fostering the special bond that exists between people and cats has been simply stated as *"Caring for Cats, and the People Who Love Them."*

In 1984, she founded the Cat Hospital At Towson (CHAT) in Baltimore, which was the first feline-exclusive veterinary hospital in the state. Dr. Brunt opened a second practice, the Cat Hospital Eastern Shore (CHES) in Cordova, Maryland, in June of 2001. Both hospitals became accredited by the American Animal Hospital Association in 2002.

Through her 23 year membership in the Association of Feline Practitioners, Dr. Brunt has participated in the veterinary and public discourse of many feline issues. She represented AAFP in the AVMA House of Delegates for eight years, and served as AAFP president in 2006. She also served as president of the Maryland Veterinary Medical Association (MVMA) and has also participated extensively in American Animal Hospital Association leadership initiatives. She has served the Greater Baltimore Veterinary Medical Association as a member, treasurer and delegate to the MVMA.

Dr. Brunt has co-authored articles in several peer-reviewed journals including the Journal of the American Veterinary Medical Association (JAVMA) and the Journal of Feline Medicine and Surgery (JFMS), and has been cited in several consumer print publications such as Cat Fancy and Cat Watch. She has appeared on radio and television to educate the public about numerous cat health issues.

Dr. Brunt has been a member of the American Veterinary Medical Association since 1975. She graduated cum laude from Kansas State University and received her doctorate of veterinary medicine in 1980. In 2007, she was honored to be named as the KSU Alumni Fellow for the College of Veterinary Medicine. She is currently involved with two feline initiatives, the **KNOW Heartworms** campaign with the AAFP and American Heartworm Society to educate veterinarians and the public about heartworms in cats and Heartworm Associated Respiratory Disease, and the CATalyst Council that is a collaboration involving the veterinary profession, animal health industry, welfare and shelter organizations and the media to improve the current status of cats in North America. Her goal is to empower and grow others to establish and enrich the special bond that exists between people and cats.

She shares her home with her two hilarious cats, Freddy and Paddy, and her loyal- though less smart than the cats- Standard Poodle, Charley.

Steve Dale

Steve Dale reaches more pet owners than any other pet journalist in America.

Steve writes a twice weekly syndicated newspaper column (Tribune Media Services), he's a contributing editor at *USA Weekend*, special correspondent *Cat Fancy*, and host of two nationally syndicated radio shows, *Steve Dale's Pet World* and *The Pet Minute* as well as *Pet Central* on WGN Radio, Chicago.

Certified as a behavior consultant by the International Association of Animal Behavior Consultants, Steve also serves on the Board of Directors of the American Humane Association, Winn Feline Foundation, Angel on a Leash and Chicago's Treehouse Animal Shelter. He's the co-chair of the City of Chicago's Task Force on Companion Animals and Public Safety and a member of the Chicago Animal Shelter Alliance. Steve regularly presents at major shelter and veterinary conferences.

Steve's appeared on *The Oprah Winfrey Show*, *National Geographic Explorer*, *Pets Part of the Family* on PBS, the Fox News Channel and various Animal Planet Shows. He was a regular on WGN-TV Chicago.

Steve edits *Pawprints*, a newsletter for veterinarians, His books include *American Zoos* and *DogGone Chicago*. He's a contributor to *Feline Behavior Guidelines* (published by Hills Pet Nutrition), which was compiled by the American Association of Feline Practitioners.

Steve's many awards include the distinguished AVMA Humane Award, American Kennel Club Responsible Dog Ownership Public Service Award, Syndicated Newspaper Feature Writer of the Year Award, American Humane Association Media Award, University of Illinois College of Veterinary Medicine Distinguished Service Award, etc.

Steve's website is www.stevedalepetworld.com

Curtis W. Dewey, DVM, MS, Diplomate ACVIM (Neurology), Diplomate ACVS

Curtis W. Dewey received his DVM from Cornell University's College of Veterinary Medicine in 1989. Following graduation he went to the University of Georgia for an Internship, and while doing a Surgery Residency there, received a MS in Anatomy. Dr. Dewey then went on to UC Davis to complete a Neurology and Neurosurgery Residency. He spent 6 years as Faculty Neurologist at Texas A&M before going into private specialty practice at the Long Island Veterinary Specialists. Dr. Dewey is currently an Associate Professor and Chief of Neurology at Cornell's College of Veterinary Medicine. He has written a textbook, *A Practical Guide to Canine and Feline Neurology*, 2nd edition, that is due to come out in the Fall of this year.

Lynelle Johnson, DVM, MS, PhD, Diplomate ACVIM

Dr. Johnson received her DVM from The Ohio State University, was in private practice on Long Island for 3 years, and completed a Masters Degree and residency program at the University of Illinois. She is Diplomate of the American College of Veterinary Internal Medicine. Dr. Johnson's Masters research investigated an experimental model of feline asthma, and she completed a post-doctoral fellowship in radiation oncology at Colorado State University. She received a grant from the National Institute of Health Heart, Lung, and Blood Institute to study the effects of exercise on pulmonary vascular function and received her Ph.D. in Physiology from the University of Missouri in 2000. Dr. Johnson is the respiratory section editor for the 5 Minute Veterinary Consult and Feline Internal Medicine Secrets, and she has manuscripts in various textbooks and journals. Dr. Johnson is a member of the Veterinary and Comparative Respiratory Society. Her research interests include pulmonary vascular biology, cardiopulmonary interactions, and clinical respiratory disease of dogs and cats. Dr. Johnson joined the faculty at UC Davis in December 2000 and is currently an Associate Professor.

Jodi Korich, DVM

Partners in Animal Health was established in 2005 by the Department of Clinical Sciences and the Veterinary Library, at the College of Veterinary Medicine. The program's mission is to improve animal health through innovative educational outreach for students, veterinarians, and animal owners. This past year, Partners in Animal Health teamed up with the Cornell Feline Health Center to create several new client education materials. These videos are now being used by thousands of veterinary hospitals across North America. Jodi Korich is the Director of Partners in Animal Heath.

David Maggs, BVSc (hons), Diplomate ACVO

Dr. Maggs received his veterinary degree from the University of Melbourne, Australia in 1988 and then spent five years in mixed animal practices there and throughout Great Britain. He completed small animal and equine internships at Colorado State University and a comparative ophthalmology residency at the University of Missouri, where he remained on faculty before joining the University of California-Davis in December 2000. He is on the editorial board of Veterinary Ophthalmology, is co-author of Slatter's Fundamentals of Veterinary Ophthalmology, and is Chair of the American College of Veterinary Ophthalmologists' Credentials Committee. Dr. Maggs' special interests include ophthalmic surgery and infectious ocular disease, particularly feline herpesvirus.

John Parker, BVMS, PhD

Dr. Parker graduated from Glasgow University veterinary school in 1983. After a number of years in veterinary practice in the UK and Australia, where he practiced in small animal, emergency and feline practices, Dr. Parker came to Cornell in 1993. He worked as a consultant for the Feline Health Center for a short period and then entered the PhD program. Dr. Parker obtained his PhD from Cornell in Virology in 1999 and then did a post-doc here at Cornell for a year and then at Harvard Medical School for 2 years where he studied mammalian reoviruses. Dr. Parker became a faculty member at the Baker Institute for Animal Health in 2003 where he has a research program studying mammalian reoviruses and feline caliciviruses. Dr. Parker is a recipient of a Burroughs Wellcome Fund Investigatorship in the Pathogenesis of Infectious Disease. He also received the Pfizer award for research excellence in 2007. His work is funded by the National Institutes of Health, the Burroughs Wellcome Fund, the Cornell Feline Health Center and the Winn-Miller trust. He is married to Dr. Tracy Stokol, a clinical pathologist, on faculty at the vet school.

There were no pages

in this section

Steve Dale's cat Ricky played the piano, and jumped through hoops – here's a cat who's life was totally enriched. Steve is certified by the International Association of Animal Behavior as a feline and also canine behavior consultant. He's spoken on this topic and others at meetings including the Conference of the American Veterinary Medical Association, Western Veterinary Conference and North American Veterinary Conference. He syndicated newspaper column is read in over 100 newspapers, and he is the host of three radio shows about pets and he makes frequent TV appearances. He's won many awards including the AVMA Humane Award, and Winn Feline Foundation Media Award. His website is www.stevedalepetworld.com.

FELINE ENRICHMENT

Enrichment is quite the Buzz Word

- Environmental
- Behavioral

A matter of manipulating the environment to suit animals' behavior or the match the animal's behavior with the environment.

"Environmental enrichment is a process for improving or enhancing zoo animal environments and care within the context of their inhabitant's behavioral biology and natural history. It is a dynamic process in which changes to structures and husbandry practices are made with the goal of increasing the behavioral choice available to animals and drawing out their species-appropriate behaviors and abilities, thus enhancing their welfare. As the term implies, enrichment typically involves the identification and subsequent addition to the zoo environment of a specific stimulus or characteristic that the occupant(s) needs but which was not previously present." [1]

"The physical environment in the primary enclosures must be enriched by providing means of expressing non-injurious species-typical activities. Examples of environmental enrichment include providing perches, swings, mirrors, and other increased cage complexities; providing objects to manipulate; varied food items; using foraging or task-oriented feeding methods; and providing interaction with the care giver or other familiar and knowledgeable person consistent with personnel safety precautions." [2]

Zoos have long been interested and have participated in providing animals with behavioral enrichment, more than what our companion animals at home receive. [3, 4, 5, 48]

Zoos feeding road kill, hiding food (under ground debris, in pipes, etc.) in exhibits, using 'giant buster cubes,' operant conditioning, orangutan's who paint, chimpanzees who use computers – even allowing great apes to choose their own music. Simply allowing them to choose, indoors or outdoors. Rotating objects in the exhibit which seem stationary, but are not, places to sit to the vines. Choose to give themselves a shower if they so desire. If they pass by a motion detector, they get a shower. A light lets them know that food is in the termite mound, and a condiment inside for chimps varies (mustard, catsup, barbeque cause, jams, etc). Optimum examples are chimpanzees in Chicago, who can blow air on the people. [46, 47, 48, 49]

It's about offering choices and giving control [46] The secret is to think like a cat – lion or a domestic cat.

Using enrichment techniques, zoos have: Lessened stereotypical behaviors, increased animals 'natural tendencies,' enhanced exercise (lowering number of overweight animals, or animals as overweight), slowed the aging process, lessened or eliminated anxious behaviors [47, 48, 49]

Presumably if enrichment techniques can help zoo animals, they can help our companion animals....

Or simply, what grandpa said. "If you don't use it, you lose it." Millions of our purring pals are braid dead – they've lost it upstairs while at the same time they've gained it around their middles. And their owners have no idea because that is how they expect cats to be.

At least 30 to 40 per cent of pets are overweight; 25 per cent obese – and even greater number in cats. These tubby tabbies likely have: [6, 7, 8]

- Change in metabolism
- Significant health issues

The average life span of indoor cats is about 14 years – though this is reduced to 4 years in cats that are allowed to roam free, exposing themselves to the hazards of outdoor life. [9, 10, 11, 12]

- Cars
- Stray Dogs
- Anti Freeze
- Wildlife
- Cold weather/Car hoods
- Cytauxzoonosis
- Human Cruelty: Shooting, cat napping
- Infectious disease

"The truth is life may be more exhilarating for cats outdoors. However, as a veterinarian my job is to encourage safety and good health," Dr. Nicholas Dodman [9]

Millions of indoor cats are likely clinically depressed. Doing nothing all day, everyday is not normal." Dr. Karen Overall [15]

Advantages of Socialization Classes for Kittens: [17, 18, 19]

Kiitty Classes Saves Lives!

- Cats must be vet checked before enrolling [20]
- They are desensitized to the carrier
- Desensitized to travel
- Desensitized to strange people, species (canines)
- Learn about proper care – which may enhance health, such as clipping nails, brushing their coats and brushing teeth
- Prevent behavior problems, before they occur
- Understand what is normal cat behavior
- Subtle Signs of Illness [21, 24]
- Feline Heartworm [22, 23, 25, 26]

- Provides a resource should problems occur later

To boost confidence, and just plain fun for kittens and for people

"Having an activated prey drive is a requirement for all cats,"
Pam Johnson-Bennett [16]

This is 'normal' feline behavior - [27, 28]

Behavioral/Environmental Enrichment: [15, 29, 30, 31, 45]

- Alleviate boredom
- Brain exercise
- Exercise / Burning calories
- Prevent behavior problems
- Assist in dealing with behavior problems if they do occur
- Enjoyment / fun
- Slows onset cognitive changes

A clear link between lack of enrichment and stress, various health problems in cats including cystitis. [31]

Every House Should Have: [15, 29, 30]

- High places where cat is allowed
- Scratching post
- Window ledge (not only high – but view outdoors)
- A cozy place (a box, tunnel)
- Room with a view, place(s) to watch the outside world

Toy Story: [29 30, 32, 45]

- Rotate toys
- Understand the kind of toys your cat likes
- Re-define toys – an empty box can be a toy
- More ideas: Empty box, bottle caps, corks, aluminum foil ball, walnut in bathub, ping pong ball.

Once a day with an interactive toy (with fabric, feathers, Cat Dancer) – that's the prescription - [32]

- Laser light (pro's and con's) [15]
- Various other toys, balls, mice toys, etc. [3]

Food Games – feed from Play'n Treat Balls, Scent Games.

Cats are not Anti-Social, Aloof: In fact, they are social [33, 34, 35]

Other furry friends....¼ of cat owners have a dog; ¼ of dog owners have a cat ...living with another cat, or another pet. [36, 37, 40, 44]

Training Cats: A Cat's Mind is a Terrible Thing to Waste: [38, 39, 41, 42, 43]

- Harness Training
- Tricks
- Agility

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Notes

20th Annual Fred Scott Feline Symposium
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YEAR OF THE CAT

A cat died and went to Heaven. God met the animal at the Pearly Gates and said, "You have been a good cat all of these years. Anything you want is yours for the asking."

The cat thought for a moment and then said, "All my life I lived on a farm and slept on hard, wooden floors... I would like a real fluffy pillow to sleep on."

God said, "Say no more." Instantly, the cat had a HUGE fluffy pillow.

A few days later, 12 mice were simultaneously killed in an accident and they all went up to Heaven together. God met the mice at the Gates of Heaven, with the exact same offer that He made to the cat.

The mice said, "Well, we have had to run all of our lives... from cats, dogs, and even from people with brooms. If we could just have some little roller-skates, we would never have to run again."

God answered, "It is done." All the mice had beautiful little roller-skates.

About a week later, God decided to check on the cat...He found her sound asleep on her fluffy pillow. God gently awakened the cat and asked, "Is everything okay? How have you been doing? Are you happy?"

The cat replied, "Oh, everything is just WONDERFUL...I've never been so happy in my life! My pillow is always fluffy and those little "Meals-on-Wheels" that
You have been sending over are delicious. "

My story begins a couple of years ago, as I was driving along listening to talk radio. I literally hit the brakes as I heard Dr. Laura say, "All cats should be coyote food."

That's when I felt the thud from the car in back of me – there was no damage to my car. What Dr. Laura Schlessinger said to her audience on her syndicated radio show was damaging.

I thought – well – let me clarify this. I'll write a story for my print column and made arrangements to speak with the good or not so good Dr.

Her publicist said 'fine,' and suggested I call Dr. Laura at an assigned time.

My response, 'Id rather spend my money on kitty litter – have her call me.' She did.

Dr. Laura told me she received many calls and Faxes about her comments, and said "People hear what they want to hear."
And despite that fact that she was apparently inundated from cat lovers, she didn't get it. Dr. Laura then added, "Cat people are different than dog people, they're less human oriented"

The truth is that Dr. Laura isn't alone among those in the media and popular culture's treatment of cat's as second class citizens.
"Jungle to Jungle" with Tim Allen (cat abuse on the big screen) / Jay Leno in his monologue just after this past Christmas said, 'We let the cat eat the tinsel right off the tree, it's what we call recycling."

We know there are more cats than dogs in America – though there are more cat homes....
Here's what we know *(which Jim Flannigan will speak more about)*

- The number of U.S. household owning pets grew to 68.7 million in 2006 from 61.1 million in 2001, an increase of 12.4 per cent. [1]
- More homes have pets than children and there are more pets than children in America. [2]
- 81.7 million pet cats (up from 70.8 million in 2001), and 72.1 million dogs (up from 61.5 million in 2001). [1]

So cats should be man's best friend – here's one catch that tells you....cats are VERY popular, but not overwhelmingly so...

- Of all U.S. Households, 32.4 per cent owned a cat in 2006. And of all U.S. households, 37.2 per cent owned a dog in 2006. – so, more dog homes.... [1]

There's no data on this but I suggest – most people like dogs....unless they've had a really bad experience with a dog, they like dogs....Not true with cats. It seems, people either love them or they hate them.

Is there a disparity between cats and dogs?

Cats don't visit the veterinarian as often. The average dog now sees a veterinarian about 1.5 times a year, down from nearly two annual exams in 2001. Even more striking cat visits have dipped to on-average less than one visit per year for the average cat. [1]

The following numbers are hard to come by – and vary depending on who you ask...but it seems cats do get the short end of the stick.

- 4.3 million animals entered responding survey shelters in 1997 ...about split between cats and dogs [3]. Others indicate more cats do enter shelters than dogs. We know this because some shelters now actually need to 'import' dogs. Few, if any, need to do the same with cats. Overall 8 to 10 million dogs and cats land in shelters annually with 4 to 5 million euthanized [4].

- Relinquished by owners in 1997: Dogs 27 per cent; Cats 35 per cent Unspecified 26.0 per cent [3].

Is this because of behavior issues which owners have a difficult time dealing and/or because cats don't have the same value as dogs?

- Of the lost or stolen animals entering shelters, 15 to 30 per cent of dogs reclaimed (HSUS), 15.8 per cent dog reclaimed (NCCPSP)
  Two to five per cent of cats reclaimed (HSUS), 2 per cent of cats (NCCPSP) [3, 4]

- If we get tired or bored of the cat, or don't want to treat for a medical condition – out the door. Half to as many un-owned cats as owned.
  - shorter lifespan for those feral and strays –adding to problem if not spay/neutered – rabies, roundworm (public health) –public nuisance. [5, 6]

- As for animal abuse, these numbers are not tracked in most crime reporting data. At the ASPCA, Anne Marie Lucas, supervisor of special investigations says, "Most people on the street will tell you, overall, more cats are abused than dogs. Even more often unreported than in dogs. Perhaps that is because cats are easier to abuse." . [7]

- We spend more money on fighting canine disease than we do feline. [8]

Morris Animal Foundation fiscal 2008 funding
Canine: $1,694,830
Feline: $602,623

Original number of pre-proposals received
Canine: 119
Feline: 37
Total for all species: 439

Number of pre-proposals received November 07 for 2009 funding when there was specifically a special call and PR push for cat related proposals from investigators
Canine: 119
Feline: 92
Total for all species: 463

Clearly, to me – it seems there's plenty of evidence which indicates. . .Yes, lots of people like cats, some people --- interestingly often seen as eccentric --- love cats. But overall, cats don't have the same place in our culture as dogs. In fact, I argue cats are like the Rodney Dangerfield of pets, they get no respect!

So, what is it about cats – why the disparity?

I went a group of experts. But before I tell you what the experts said – let me go back in t

Way back in time – in the Middle Ages, cats were most often revered. [9, 10]

Felis silvestris catis likely were likely self-domesticating and descended from the African Wild Cat, and also other species, including the Sand Cat and Asian Desert Cat. We know the Asian Desert Cat was intentionally interbred with the African Wild Cat in Egypt around 2500 B.C. The earliest real proof of domestication came around 4500 B.C. and in Egypt and it took around 2,000 years before cats were pretty clearly a part of society. Because by then we had societies – and they were rampant with rodents, not to mention snakes. It wasn't long before cats in Egypt were revered, even mummified and

symbol of dieties. But researchers indicate around the same time cats were being domesticated elsewhere as well. [9, 10]

And while revered in Egypt – it wasn't that way everywhere...Not in the Far East where they were considered pets....Worse in Europe, they became associated and at first even blamed for the Great Plague....Of course, they eventually did figure out cats could help by killing rats who spread the plague. [9, 10]

Historically, too – the world loved them or hated them...still, it's true. And tons of folklore and fairytales involving cats. [9, 10]

So – even now, it's not the Dark Ages anymore – we love dogs, why do we either love or hate cats? I went a group of experts. Students at Walter Payton High School on Chicago's near north side. Comments added in from a recent radio show, where I asked listeners the same.

Here's what those who didn't have a cat, never owned cats had to say:

They're aloof
They're mysterious
They're hard to understand, interpret
They're sneaky, conniving
They can't be trained to do things
They never come when called
They ignore people
They don't care about their people
They're antisocial
They're unpredictable

Here's what those who have one or more cats or who have had cats had to say:

They're smart
They're too smart
They're hard to understand
They're fun
They're sweet, affectionate, lovable, etc.
They're unpredictable
They never come when called
They're aloof
They love us
They're too needy

Reader letters about cats, and this year in particular I want to use these. Here's are two:
Q: After having my cat for about a year, she's developed a new behavior in the garage. We keep her in the garage as a mouser. Now, she goes on top of the vehicles. She's not seeking warmth because two of the vehicles are driven very little. Why the sudden change? - D.S., Cyberspace [11]

Q: My cat has been missing the litter box for months. We love pets, but we're exasperated. Our three dogs have the run of the house, but we don't allow the cat to wander freely because my husband doesn't care for cats and the dogs don't,

either. We keep the cat downstairs. She's pretty happy, unless one of the kids lets a dog down there. And my kids are at the terrorize-the-cat age. We've read about offering more than one litter box, so we now do that, and we've switched litters. I do keep the box as clean as I can. What's the problem? - C.H., Jackson, MI [11]

Why are cats second class citizens. I don't know.

Sometimes popular culture and years of misinformation is simply accepted as fact. It may be that simple...I don't know. I do know that as a result cats are dying. That's right, dying. Feral cats....cats euthanized in shelters...cats who could see the veterinarian, who don't...

I believe with all my heart that all of us need to come together....this isn't a veterinary problem, it's not a shelter problem, it's not a problem of the not-for-profit world....It's a problem shared by all of us – as I told Dan Kramer before he created this little get together...We can get something done working in our little corners of the world. As a coalition as working together, we can change the world. We need to. The cats need us.

If Garth Brooks can perform in Central Park, Ricky can play on the front steps of our condominium. At one such outdoor concert, a 10 or 11 year old boy with Down's syndrome walked by. He was enthralled with Ricky, starring expressionless and motionless for nearly five minutes. Suddenly, he began to laugh. We're not talking little giggles here, I mean big full blown belly laughing.
His mother quietly said, "Billy's father passed on two weeks ago. Everyone has tried to get him to talk, to react."

Just then, Billy, who was still in stitches, reached over to pet Ricky.
Ricky rubbed his face on Billy's arm, and nonchalantly walked up on his shoulder. Then Billy sat down and snuggled with Ricky, now in his lap. I don't know what secrets Billy shared, but he talked for several minutes straight, sometimes laughing and sometimes crying. Just before he and his mom walked off, he looked at Ricky and said, "I love you," and then he kissed him. It's a kiss that I'll never forget.

We can, we must all come together, and elevate the image of cats...and the potential result: Less abuse, less owner relinquishments, eventually fewer feral cats, more spay/neuters...clients will become more aware of 'cat signaling' or 'cat language,' in other words understanding subtle signs of illiness in cats, there will be more money given to cat related charities, more investigators motivated to learn and research to solve feline disease related and behavior related problems....More veterinary visits and a willingness to spend more money on those vet visit.

Lofty goals. I say let's jump ahead and we can and will land on all fours. But we don't have 9-lives which to do this. The cats need us, now.

[1]American Veterinary Medical Association U.S. Pet Ownership & Demographics Sourcebook, 2008.
[2] United States Census Bureau (Report on Demographics)
[3] National Council on Pet Population & Study, www.petpopulation.org.
[4] Humane Society of the United States, www.hsus.org.
[5] Bryan Kortis, TNR consultant Humane Society of the United States, "Implementing a Community Trap-Neuter-Return Program" (published by the HSUS, 2007).
[6] Personal interview October, 2006 Becky Robinson, president Alley Cat Allies, www.alleycat.org.
[7] Personal interview, Anne Marie Lucas, ASPCA supervisor of special investigations
[8] Morris Animal Foundation
[9] "The Royal Canin Cat Encyclopedia" (Royal Canin Group, 1999), pg 4 to 9 and 18 to 24.
[10] "The Encyclopedia of the Cat," by Bruce Fogle, DVM (D.K. Publishing, New York, NY, 1997), pg. 6 to 11 and 20 to 53.
[11] *Steve Dale's Pet World*, Tribune Media Services syndicated newspaper column. www.stevedalepetworld.com

Kitty K.....

KITTY-K notes

Introduction:

Classes for kittens are, in part, based on Guidelines created by the American Association of Feline Practitioners[1, 38]. If puppies can attend kindergarten, why not kittens? Just as socializing dogs saves lives, the same turns out to be true for cats[2]. For one thing, people are more likely to tote their cats to a vet's office if they're willing subjects. The classes are an effective method for kitties to be desensitized to their carriers, to strange people even to dogs. Getting out in the world is enriching! When it comes down to it, puppy classes are about teaching people - same is true here, and topics included are why de-claw is not necessary and litter box 101. What's more, you can train a cat to do things; the benefits of clicker training for cats are discussed.

Veterinary behaviorists endorse kitten socialization classes[1,2,3,4]. These classes were created about a decade ago in Australia by veterinary behaviorist Dr. Kersti Seksel.

Cats visit the veterinarian less than half as often as dogs, yet there are 20 per cent more dogs than cats in America[5].

- Fear of the carrier
- Fear of car ride
- Fear of strange places, smells, sounds

Also, people may feel cats are more independent, and therefore, somehow don't require medical attention[6].

More cats are abandoned or relinquished to shelters than dogs; more cats are abused than dogs[7]. I believe even though there are more felines than canines – it's a good thing cats are have nine lives, they are somehow second-hand citizens.

There are just over 60 million dogs, and over 70 million owned pet cats in America, AVMA[5]. (90 million cats and 70 million dogs according to the American Pet Product Manufacturer's Association8).

It seems logical that if cats are acclimated to their carriers, to cars, and to the veterinary clinic – they are more likely to receive a more efficient exam, without a veterinarian doing a 'best guess' of blood work (for diabetes and kidney disease), detecting a heart murmur and getting a baseline for pulse and/or blood pressure. Fractious cats just can't possibly get the kind of thorough exam as calm cats asking to be petted.

For sure, what's most important – being positively predisposed to go to the vet office will get more cats into see veterinarians. The impact on their health is then undeniable. Ideally, all pets should visit their veterinarians twice annually for wellness exams.

Socialization Period of Cats[1]:
4 weeks: Social play begins
5 weeks: Predatory behavior starts
6 weeks: Object and locomotry play starts
6-7 weeks: Adult like locomotion
9 to 14 weeks: Social play peaks
16 weeks: Object and locomotory play peaks/territoriality may begin

Socialization is not about play. Socialization is learning to tolerate members of one's own species as well as members of other species.

Value of Kitty Classes

Behavioral Enrichment. I'm glad that increasingly cats are indoors[9]. But we have a nation of brain dead fat cats.

At least 30 to 40 per cent of pets are overweight; 25 per cent obese – and even greater number in cats[10,11,12]. These tubby tabbies likely have:

- Change in metabolism
- Significant health issues

Kiitty Classes Save Lives!

- Cats must be vet checked before enrolling [38]
- They are desensitized to the carrier
- Desensitized to travel
- Desensitized to strange people, species (canines)
- Learn about proper care – which may enhance health, such as clipping nails, brushing their coats and brushing teeth
- Prevent behavior problems, before they occur
- Understand what is normal cat behavior
- Subtle Signs of Illness [6, 37]
- Feline Heartworm [35, 36, 39]
- Provides a resource should problems occur later

To boost confidence, and just plain fun for kittens and for people[1,2].

Dispel Myths

Cats are not anti-social, albeit they are independent but social [13, 14, 21]
Cats can be trained [2,19, 20.] You train cats to enhance the animal/owner bond, not for the same practical reasons as you may a dog.

Curriculum

Week One Curriculum[1,2,15]

- Introduction/Handouts
- Video on Cat Training from Steve Dale

- Keep cats indoors/environmental enrichment
- Pass the kitty
- Leash and harness – how cats can be safe outdoors
- Kitty play session
- Demo of nail clipping
- Brushing cat demo
- Clicker training explanation/demo
- Pass the kitty (at vet office in an exam room)
- Kitty play session
- Questions

Week Two Cirriculum[1,2,15]

- Clicker show 'n tell
- Bring out the dogs
- How to play with cats
- Kitty play session
- Introduction of dogs
- Litter box 101
- Pass the kitty
- Scratching posts talks and demo
- Tooth brushing demo
- Pilling demo
- Feeding the cats
- Pass the kitty
- Kitten play session (at vet office in exam room)
- Questions

Class Rules, General Class Information [1,2]

- Kittens must be vet checked with a signed health certificate.
- Only kittens 8 to 14 weeks of age, according to Dr. Seksel. I take kittens up to 15 weeks.
- Do not feed kittens within a few hours before class
- Carrier desensitization handout is emailed or Faxed before attending first of two classes. (Handout is at www.stevedalepetworld.com)
- Purchase leash and harness
- Purchase toothbrush (for pets)

Health Certificate[1, 2, 6 35, 36, 36, 37, 38, 39]
Is at www.stevedalepetworld.com

Instructor provides [1,2]

- Litter boxes (ready to be trashed or dumped if used).
- Clickers
- Assorted toys

- Assorted scratching posts (handout on why not to declaw at www.stevedalepetworld.com)
- Feliway diffuser
- Indoor garden

Why we do we play pass the kitty:

To sensitize the kitties to handling by strangers, and therefore have them be more accepting on vet exams, and even by owners who should examine their pets at home. Cats, in particular, are subtle about presenting signs of illness[6]. Also, they will be acclimated to being handled by relative strangers, such as pet sitters or kids visiting your own children, for example.

Cats handled frequently at younger ages benefit physically, and also 'emotionally,' showing less fear and greater confidence and friendliness[16].

Age appropriateness[1]:
3 to 9 weeks, Human contact and handling very important, even necessary
Less than 12 weeks, handling and routine restraining
7 to 12 weeks social play
Over 14 weeks, learn to play fight

- We point out what is normal kitten behavior, and how cats signal/communicate [17, 18, 21.]
- We point out how cats learn.[20, 22, 23, 24]
- We encourage children in the class (under 8-years must have a second adult present)[2].
- Teach how to scratch in all the right places [1, 21, 25, 26, 27, 28]

"Think Twice Before you Declaw" download from www.stevedalepetworld.com [29].

- We teach 'Litter Box 101' [1,30,31,32, 33, 34]
- Other topics include – but aren't limited to feline aggression, introducing a new cat, shy cats, etc.

Training Cats: Why Bother [20]:

- Appropriate outlets for excess energy
- Better understanding, communication between humans and feline
- Exercise for the mind (as well as physical exercise)
- Learning begets learning – they learn to learn

If people better understand their kitties, and enhance their bond – perhaps they will be less likely to relinquish their cats if something does go wrong.

One quarter of pet owners with one or more cats statistically also have a dog[5,8]. This is why we introduce cat friendly dogs into the class. Barking is actually a good thing so they are desensitized to the sound. However, too much – an overload of sound and/or handling (particularly if a kitty is already somewhat stressed) is not a good thing, and is too stressful[2].

Where Classes Are Held:

Advantages and disadvantages to holding classes in various locations, from veterinary offices (where they are exposed to that cold exam table, but finding enough kitties to participate from one practice may be impractical) to a dog wash to a bank.

Requirements for the location:

- Sanitary – cleaned if there were previous cats at the location, but the hope is that there were none.
- Closed door – so kitties don't run off
- Size appropriate, too large a space offers kitties too much freedom; too small may not allow for chairs for people to comfortably sit.

Marketing/Promotion of classes:

Without kitties, you have no class. Two or three minimum, with six to eight maximum. One veterinarian encourages clients by offering a rebate. You can work with a shelter, so when they adopt out kitties your class is mentioned. In return, any press attention is shared with that shelter. Print flyers. Send out press releases.

Enrollees must sign a waiver indicating their likeness may be used in the media.

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National Pet Wellness Month: www.npwm.com

Healthy Cats for Life: www.catwellness.org

American Heartworm Society: www.heartwormsociety.org

Detailed Curriculum, Class Rules, Sample Health Certificate, Legal Release for Media Coverage, L[9]ist of Favored Additional Resources/References, sample fliers and press releases are all available at www.stevedalepetworld.com (click on Kitty-K tab).

Additional addendum of references at www.stevedalepetworld.com (click on Kitty-K tab)

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Tribute to
Jean Holzworth

Dr. Jean Holzworth (1915-2007)
Feline Practitioner Extraordinaire

Fred W. Scott

The 20th Annual Feline Symposium at Cornell University is dedicated to the late Dr. Jean Holzworth. Dr. Holzworth was undoubtedly the leading feline practitioner in the U.S. during the 1950s and 1960s, before it was fashionable to be a feline practitioner, and she had a strong influence on the establishment of the Cornell Feline Health Center. This is a brief overview of her life, and her contributions to feline medicine.

Early years

Jean Holzworth was born March 26, 1915 in Port Chester, NY. She grew up on a "gentleman's farm" on beautiful Lake Waramaug in New Preston, Connecticut, with animals of all sorts, including cattle and many cats. In later life in retirement, she returned to Lake Waramaug and made her home on the opposite side of the lake from the family farm, which had been sold for development of expensive homes.

Undergraduate years

Jean attended Greenwich Academy and Bryn Mawr College where she received degrees of A.B. (1936), M.A., and a Ph.D. (1940) in Latin. Her Ph.D. dissertation was entitled *An unpublished commentary on Ovid's "Fasti" by Arnulfus of Orléans*. In 1936 she won the University of Cincinnati prize of $1,000 for translating one of Horace's poems, and writing an essay on "Horace and Augustus." She used her prize money to spend the 1937-1938 academic year at the American Academy in Rome, Italy, continuing her graduate studies in Latin.

Cornell years

In the early 1940s, Jean taught at Mount Holyoke College, but the death of so many of her faithful feline friends during her growing up years, and the especially one special feline's death in 1943 due to panleukopenia, turned her toward veterinary medicine. She applied to the College of Veterinary Medicine at Cornell during the last year of World Ward II when, according Jean, "most would-be veterinarians were still overseas and admissions committees were scraping the bottom of the barrel." Her reason for becoming a veterinarian from the get-go was the "humble cat." In 1949, Jean received the Borden Award, a national award presented at each veterinary college for the veterinary student that has the highest academic grade preceding their senior year. She graduated from Cornell in 1950 as the only woman in her class. Her senior seminar was on *Salmonella pullorum*.

Angell Memorial Animal Hospital

Immediately after graduation from Cornell in 1950, Dr. Holzworth joined the Massachusetts S.P.C.A. Angell Memorial Animal Hospital in Boston as an intern. She later joined the staff at Angell, where she became head of the Cat Clinic. She practiced strictly feline medicine, and conducted feline research, at Angell throughout her entire 38-year professional career, until her retirement in 1986.

Accomplishments in feline medicine, and some of her publications

1. **Authority on feline medicine**: At Angell, Jean Holzworth quickly became the preemptive authority in the world on feline diseases and feline medicine, and continued in that role throughout her professional career. In 1950 there was almost no research done on diseases of cats – cats were simply treated as small dogs. She eagerly stepped to the forefront with expertise and an insatiable appetite to learn all she could about feline diseases. The American Association of Feline Practitioners was still 20 years from being launched, and so Jean quickly became the voice of, and the advocate for, feline medicine.
2. **Interns**: Over the years Jean trained many interns at Angell, and transmitted to them a thorough knowledge and love of feline medicine. Many of the veterinary colleges today are staffed by senior clinicians that obtained their feline expertise under Jean's tutelage.
3. **FIP**: Jean was the first to describe feline infectious peritonitis, which she initially called "chronic fibrinous peritonitis." Her description of FIP was first presented at the Annual Conference of Veterinarians at Cornell in January 1962, and reported in the Cornell Veterinarian under the title of "Some important disorders of cats." [Cor. Vet. 53:157-160, 1963]
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8. **Leukemia and related neoplasms in the cat**: [JAVMA 136:47-69, 1960; 136:107-121, 1960]
9. **Pancreatic insufficiency and diabetes mellitus**: [Cor. Vet. 43:502-512, 1953]
10. **Cryptococcosis in a cat**: [Cor. Vet. 42:12-ff, 1952; Cor. Vet. 43:546-550, 1953]
11. **Anemia in the cat**: [JAVMA 128:471-ff, 1956]
12. **Infectious diseases of cats**: [Cor. Vet. 53:131-143, 1963]
13. **Neoplasia of blood-forming tissue in the cat**: [Annuals New York Academy of Sciences 108:691-701, 1963]
14. **Reticulum cell myeloma in a cat**: [Cor. Vet. 47:302-315, 1957]

Diseases of the Cat: Medicine and Surgery

Early in her career, Jean Holzworth decided that "cats deserved a serious book to themselves" and she set out with the encouragement of her colleagues to write *Diseases of the Cat: Medicine and Surgery*. The initial target date for publication was 1962. She was a perfectionist, and wanted this book to be complete, up to date, and the best authoritative reference on feline medicine. But in her words in the Preface, "As fast as I completed a draft, however, it was outstripped by the torrent of research and clinical reports of which my favorite species increasingly became the subject. Ultimately I realized that only a band of specialists could handle the project, and I became, as well as author, the editor of a collaborative text."

While this was a solution to the dilemma of all the new information and specialties in feline medicine, it also presented a mammoth challenge and frustration to Jean. She was an incurable perfectionist, and she had an "insistence on the scholarly, clear, and economical use of

words," as Donald Patterson wrote in the Foreword. Some drafts of chapters did not come up to her high standards, so extensive editing had to be done. She told me once that she went to the library and personally double checked every reference listed at the end of every chapter.

Diseases of the Cat was initially intended to be published in 2 volumes. Volume 1 was finally published in 1987 by WB Saunders, some 25 years after the initial target date. Because of the monumental task of producing and editing this volume, volume 2 never saw the light of day.

The Cornell Feline Health Center has made a tentative commitment to produce a new multi-authored edition of *Holzworth's Diseases of the Cat*. Preliminary discussions have occurred with the publisher, and if this works out and the new edition is well-received by the veterinary profession, it is hoped that this book will be updated regularly with new editions for many years to come.

Honors

1. **ACVIM**: Jean Holzworth was a charter member of the Specialty of Internal Medicine within the American College of Veterinary Internal Medicine.
2. **AAFP**: She was voted an Honorary Member of the American Association of Feline Practitioners.

Cornell Feline Health Center

Jean Holzworth was a strong supporter of Cornell and the Feline Health Center (FHC). She strongly encouraged me to start the Center in the early 1970s, and she continued to be an encourager over the years. After I retired at the end of 1996, Jim Richards continued to keep in touch with her, and he made a point to call her once a month and inquire how her beloved cat Zoë was doing. Jean wanted the FHC to continue to "improve the health and well-being of cats everywhere," as she had tried to do during her professional career.

For a number of years, Jean served on the Feline Advisory Council of the FHC. Her input at these Council meetings was always insightful and profound. Teaming with the late Dr. Barbara Stein of Chicago, I always felt the FHC had the best two feline practitioners in the country as members of this Council.

Jean donated most of her extensive collection of books and papers on cats to the FHC, and these are being catalogued for inclusion in either the Library at the College, or in the offices of the FHC.

Jean Holzworth Bequest

Jean Holzworth died on January 13, 2007, and she left a sizeable portion of her estate to the Cornell Feline Health Center with very specific and detailed instructions that these funds were to be invested as endowed funds, and that the income from this endowment was to support clinical research on feline diseases. This was her way to ensure that she would continue to promote an improvement in the health and well-being of cats everywhere. Her house on Waramaug Lake has been sold, and the estate is still being settled as this is written. The exact amount of the bequest to the FHC has not yet been established, but it is estimated to be about 2.3 million dollars. As she requested, these funds will be placed in an endowment at Cornell, and the income from that endowment will support clinical feline research in perpetuity.

A Feline Fellow position has been established at Cornell to train future academics in feline clinical research, and this position will be supported in part by the Holzworth bequest. This is a post-residency training position, believed to be the first of its kind in the U.S. The first Feline Fellow, Dr. Kelly R. Hume, has been selected and will start her program on August 1, 2008. Dr. Hume has just completed her Residency in oncology at North Carolina State University.

It is anticipated that the remainder of the income from the Holzworth bequest will be awarded to faculty at Cornell through a competitive grants program much as is currently done in a more modest way by the FHC.

Personal reflections about Jean Holzworth

I first met Jean Holzworth during my student years at Cornell when she returned to the Annual Conference. During my practice years in Rutland, VT in the early 1960s, she was a key source of information about feline diseases, usually in the form of published articles. She was THE feline expert I could turn to for feline related information.

When I returned to Cornell in 1965, during my early years of research on feline infectious diseases, Jean was an invaluable source of information for me. She was without question the premier feline practitioner that I could turn to for input. We often discussed various items of interest in feline medicine, and she invited me to Boston in 1968 to give a seminar on feline panleukopenia for the staff at Angell. Almost 20 years later, as she was editing my chapter on panleukopenia for *Diseases of the Cat*, she called me with a question or a clarification. She stated something like: "In 1968 when you gave the seminar at Angell on panleukopenia, you said . . ." I had long-since forgotten what I had said at that seminar, but Jean had not. She was then holding me accountable, and was correcting me, for something I had said, perhaps in passing, many years before.

Feline Neurology Updates

20th Annual Feline Symposium

Cornell University

July 25, 2008

Curtis W. Dewey, DVM, MS

Introduction

The often-repeated statement that cats are not small dogs is borne out well by our experiences with feline neurologic disorders. Certainly, there are some very similar diseases of the nervous system between dogs and cats, but enough important differences to make this a timely topic. This presentation is meant to provide a practical overview of some very utilitarian principles regarding the handling of the cat with neurologic disease as well as some useful information that should help in the diagnosis and management of these disorders. Finally, some recent and upcoming clinical research in feline neurology at Cornell will be discussed.

Performing the Neurologic Examination in the Cat

There are several important differences pertinent to this examination in the feline patient. The first and most important is that cats often tend to lose their patience during the neurologic examination. The two most important principles associated with this phenomenon are: 1) move quickly and efficiently, and 2) when a cat decides he or she is done with the neurologic examination, you should follow the patient's lead and come back to the cat a bit later. Here are the essentials of the feline neurologic examination, along with some pointers specific to this species:

- *Mental status and behavior*-the owner's perception of this is crucial. Also, allow the cat to wander around the examination room (make sure the door is closed) and try to ascertain if the patient is appropriately responding to his/her environment. Sometimes it is very obvious that a cat's mental state is abnormal. Other times, the owner's history is the best information you have available to you.
- *Attitude and posture*-attitude means the position of the head in relation to the body, whereas posture is the position of the body with respect to gravity. Here you are looking for things such as head tilt, leaning to one side, recumbency, wide-based stance etc.
- *Gait*-you will often gain a lot of information by watching a cat walk. Again, don't leave the door open. Also, try not to have furniture available for the cat to crawl under-this is the first thing the patient will go for. Cats often will walk with a crouched pelvic limb gait when there is a lesion from T3 caudally-it does not necessarily mean cauda equine. Some cats will also crouch like this with orthopedic disease of the pelvic limbs.
- *Postural reactions*-this can be tough in cats. Often it is difficult or impossible to perform proprioceptive positioning-cats just pull their feet back when you try this. I recommend tactile placing, hopping, hemiwalking and wheelbarrowing in cats.
- *Cranial nerves*-do this quickly as many cats don't like you messing with their face for very long. Here is the breakdown of nerve vs. associated brain region: CN I and CN II

(forebrain), CN III and CN IV (midbrain), CN V (motor-pons, sensory-very large tract, from midbrain to first few cervical spinal cord segments), CN VI-XII (medulla). In cats, rubbing the nose (CN V sensory) will typically elicit both a lick response (CN XII) and a swallow reflex (CNs IX-XI).

- *Spinal reflexes*-I grade these as absent, weak, normal, or exaggerated (which may include clonus). Cats often lack an obvious panniculus or cutaneous trunci reflex, so don't be too concerned if you don't elicit one.
- *Palpation*-checking for swelling or atrophy.
- *Pain perception (nociception)*-looking both for regions of hypersensitivity (hyperesthesia) and lack of normal sensation (e.g., checking the toe sensation in a paraplegic cat). Cats often do not like their thoracolumbar spine palpated, so be careful not to over-interpret an adverse reaction to this.

Feline Seizure Management

We often deal with cats with seizure disorders, and feel that is a frequently-encountered problem in this species. There is fairly recent evidence that suggests that idiopathic epilepsy is more common in cats than previously believed. The first-choice anticonvulsant for cats is phenobarbital, typically starting at a dose of 2.5 mg/kg BID. Bromide is effective for canine seizures, but has been shown to be fairly ineffective in cats and also leads to an asthma-like condition in at least a third of feline patients. Oral diazepam is effective as an anticonvulsant in cats, but has been associated with fatal hepatic necrosis in this species. Oral levetiracetam @ 20 mg/kg TID has been shown to be safe and effective in cats when added to phenobarbital therapy. We have also found intravenous levetiracetam to be useful in cases of cluster seizures and status epilepticus. There is anecdotal evidence that oral gabapentin may be a safe and effective anticonvulsant drug for cats. However, there are no published reports to support this. We are currently investigating the potential use of a new anticonvulsant drug for cats called pregabalin. Pregabalin is the "next generation" of gabapentin and has been shown to have a longer half-life of elimination in dogs than its predecessor; preliminary data also suggest that pregabalin is a very effective drug in dogs. Zonisamide is a very effective anticonvulsant drug in people and dogs, and we have limited experience with its use in cats. The pharmacokinetic data suggest that this drug could be given once per day in cats. The doses evaluated recently in a feline kinetic study were very high, and half of the cats exhibited side effects. This may be a potentially useful drug for cats, but more work needs to be done.

Selected Feline Encephalopathies

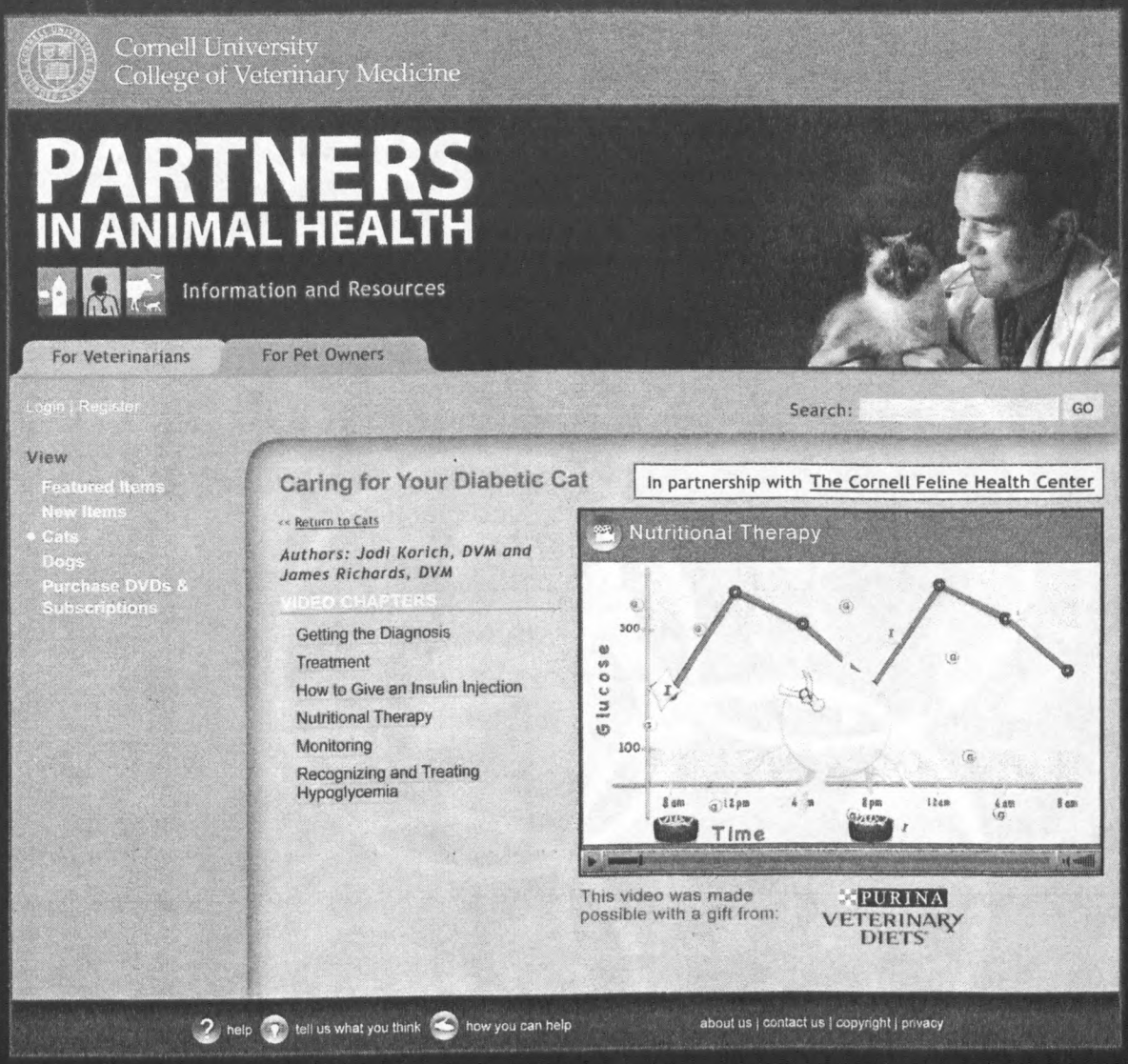
When considering feline encephalopathies, it is useful to divide the potential disorders via the following scheme:

- *Degenerative*-includes lysosomal storage diseases, cognitive dysfunction syndrome, etc
- *Anomalous/Developmental*-includes congenital hydrocephalus, intracranial arachnoid cysts etc
- *Metabolic*-includes hepatic encephalopathy, hypoglycemic encephalopathy, etc
- *Neoplasia*-includes primary and secondary brain tumors

- *Nutritional*-thiamine deficiency
- *Inflammatory/infectious*-includes FIP, bacterial meningoencephalitis etc
- *Ischemic/vascular*-includes cuterebra-related and hypertension-related strokes
- *Traumatic*

Case examples will be used to discuss the principles of diagnosing and managing some of these disorders in cats. Some time will be spent discussing feline brain tumors, specifically meningiomas, as these tumors are often managed successfully via surgical removal.

Partners in Animal Health



www.partnersah.vet.cornell.edu

The Partners in Animal Health Program was established in 2005 by the Department of Clinical Sciences and the Flower-Sprecher Veterinary Library. This unique program is committed to developing high quality multimedia educational resources that are distributed to a worldwide audience. Over the past 3 years, Partners in Animal Health has worked with the Cornell Feline Health Center to develop a series of online feline videos for cat owners. These videos, made possible through funding from Nestle Purina Pet Care, Heska Corporation, and the Clara L.T. Jeffery Charitable Trust, are available to veterinarians and pet owners online at no charge.

Our Mission:

To improve animal health through innovative educational outreach for students, veterinarians, and animal owners.

What's in a name?

The educational resources produced by Partners in Animal Health help build and maintain partnerships between faculty, students, private veterinarians and animal owners. These resources play a vital role in helping the College fulfill its mission by providing tangible bridges that extend the College's influence beyond the physical borders of our campus. Partners in Animal Health works to build global educational alliances taking advantage of computer and internet technologies to improve animal healthcare worldwide.

Caring for Your Diabetic Cat

PROJECT AT-A-GLANCE

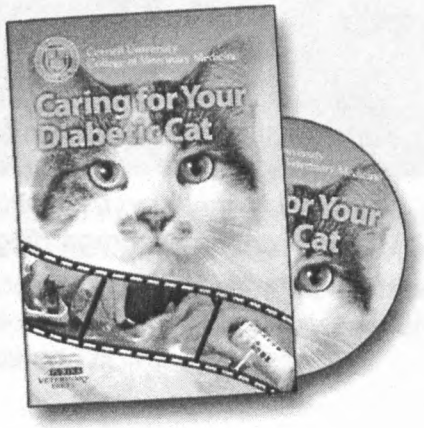
Studies show that less than 15% of owners whose cats have chronic conditions, like diabetes mellitus, follow all their veterinarian's treatment recommendations. In diabetes, this poor compliance often leads to a suboptimal patient response and frustrated clients. Diabetes is a complex condition and many cat owners have a poor understanding of their cat's medical problem. In the emotional days following the initial diagnosis, it can be especially difficult for cat owners to fully grasp the large amount of information conveyed in the exam room. In this video series, clients can learn about diabetes by following actual patients through their experiences living with diabetes, from early diagnosis through long-term insulin therapy. This comprehensive video series is designed to help you provide your clients with a fundamental understanding of diabetes management, while addressing the common fears and concerns associated with this condition.

VIDEO TOPICS INCLUDE:

-Why cats develop diabetes and how diabetes affects the body
-How to recognize the warning signs of diabetes
-How diabetes is diagnosed and the value of routine screening
-How diabetes is treated, including dietary and insulin therapy
-Home monitoring and routine veterinary check ups
-Step-by-step instructions on how to give insulin injections
-How to recognize and deal with a hypoglycemic crisis

"What an excellent video! It explained everything I needed to know about my newly diagnosed diabetic cat. Your video went into more detail than my vet. He gave me the website address. Thank you."

-Cheryl V., pet owner



Cat Owner's Guide to Kidney Disease

PROJECT AT-A-GLANCE

According to an American Animal Hospital Association study in 2003, the number one reason pet owners fail to adhere to medical treatments is an insufficient understanding of their pet's condition and an incomplete knowledge of available treatment options. This comprehensive video can help your clients understand all aspects of kidney disease from routine screening for early diagnosis to treatment options for all stages of kidney disease. This video series is designed to help cat owners understand the importance of taking a proactive approach to treating kidney disease and provides a wealth of practical tips on how to help their cats live a longer and healthier life.

VIDEO TOPICS INCLUDE:

-Why cats develop kidney disease and how it affects the body
-How to recognize the warning signs of kidney disease
-How kidney disease is diagnosed and the value of routine screening
-How kidney disease is treated, including dietary and drug therapies
-Home monitoring and routine veterinary check-ups
-Step-by-step instructions on how to give subcutaneous fluids

"Your video on kidney disease is extraordinary in the clarity of presentation, the quality of the video itself, and the organized manner in which the information is delivered. Thank you for making such a meaningful video for cat owners regarding this disease."
-Frances K., pet owner

Pet Owner's Guide to Cancer

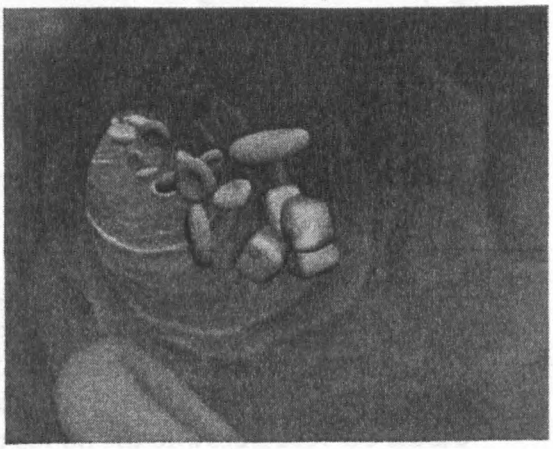
PROJECT AT-A-GLANCE

Nearly 1 in 4 pets will develop cancer. This video provides pet owners with a wealth of information, covering everything from how to protect pets from cancer to an in-depth look at pets undergoing radiation and chemotherapy. This new video series, developed in partnership with the Cornell oncology service, is part of a growing collection of resources available for pet owners and veterinarians on our new website.

VIDEO TOPICS INCLUDE:

-How pets develop cancer and how they can be protected
-How to recognize the warning signs of cancer
-How to perform an at-home wellness exam on your pet
-How cancer is diagnosed and the importance of early detection
-How to make treatment decisions for your pet
-Behind-the-scenes look at pets undergoing chemotherapy and radiation

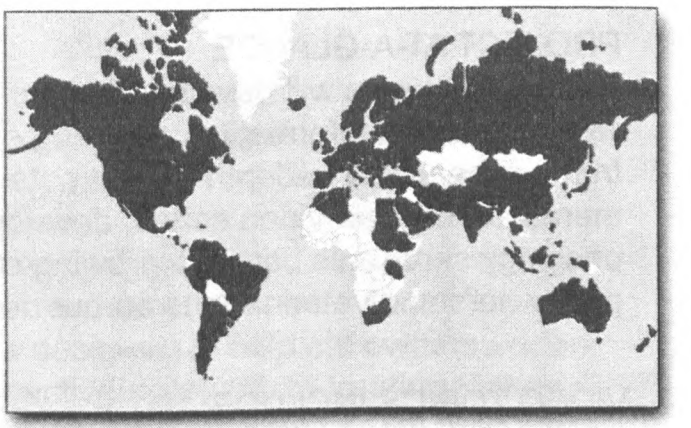
"I watched you video online and I am more impressed than words can say. So many of the millions of questions in my head were touched on. All the information was easily understood yet I didn't feel as though I was being spoken down to. Bravo on an excellent presentation.
-Kathy L., pet owner



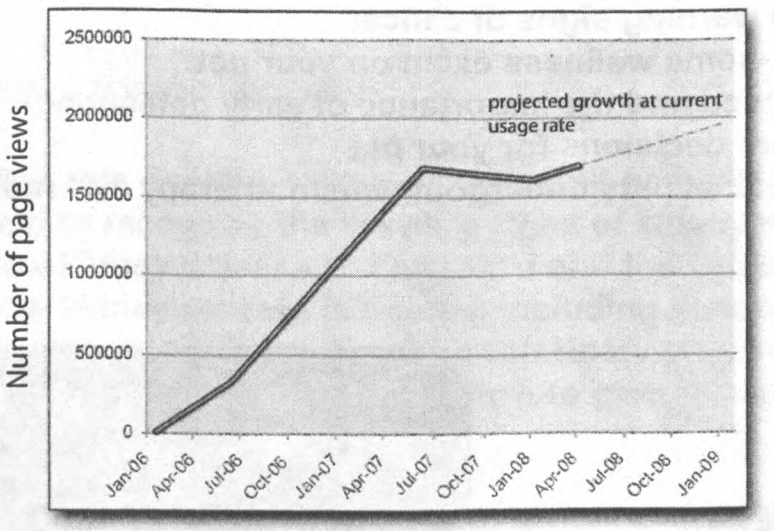
Using a unique combination of video and realistic 3D animations, this video series allows pet owners to "travel" inside their pet's body and learn about how cancer develops and how it can be treated.

Measuring Impact

A comprehensive web tracking system, provided by Google Analytics, allows website usage statistics to be measured and analyzed. This map demonstrates the power of internet distribution to reach a global audience quickly. In a span of only 8 weeks, following the launch of the new Partners in Animal Health website in March 2008, the website reached 97 countries around the world.



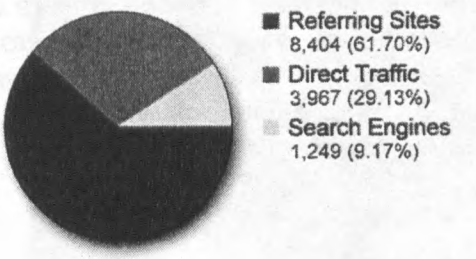
Areas in green show countries we have reached



Since 2006, there have been over 5.6 million page views recorded on our website.

How are people finding us?

61% of our visitors come to the website via referral, i.e. clicking a link from another website. The power of internet distribution lies in this amplification effect. External links from other websites help distribute our resources into the hands of people we could not reach ourselves.



Available Feline Videos

Giving Your Cat a Pill or Capsule

Giving Your Cat Liquid Medications

Trimming Your Cat's Claws

Brushing Your Cat's Teeth

Taking Your Cat's Temperature

Caring for Your Diabetic Cat

Pet Owner's Guide to Cancer

Cat Owner's Guide to Kidney Disease

All videos are available on our website at:
www.partnersah.vet.cornell.edu

Selected videos are now available for sale on DVD.
DVDs can be purchased by credit card on our website or by calling 607-253-3018. Or write to us at partnersah@cornell.edu

Log on to the Partners website and register to become a member. Membership is free and you will receive email alerts when new videos become available online.

Feline Herpes Virus - Clinical Syndromes and Diagnostic Testing

FELINE HERPES VIRUS — CLINICAL SYNDROMES AND DIAGNOSTIC TESTING

David J. Maggs BVSc(hons) Diplomate ACVO
Associate Professor, Comparative Ophthalmology
University of California-Davis

Feline herpesvirus is a ubiquitous virus that varies very little worldwide; i.e. strains do not vary greatly in their clinical virulence. And yet, we see a huge range of clinical signs in cats infected with this virus. There are probably a large number of reasons for this; however principle among these is likely the host's response to this virus. FHV-1-naïve kittens infected in the first few weeks of life against a backdrop waning maternal immunity almost inevitably get severe upper respiratory and ocular disease with high morbidity but rare mortality. By contrast, adult cats can undergo viral reactivation with viral shedding and can infect in-contact cats; all without demonstrating clinical signs themselves. These two scenarios represent just the two extremes of infection; within your clinic you see cats with a huge diversity of clinical signs in between. For this reason, I like to consider clinical signs associated with FHV-1 under one of three broad categories: primary (first time) infection, recrudescent infections, and FHV-1-associated syndromes.

CLINICAL SIGNS

Primary herpetic disease

Primary ocular FHV-1 infection is characterized by blepharospasm, conjunctival hyperemia, serous ocular discharge that becomes purulent by day 5-7 of infection, mild to moderate conjunctival swelling, and often conjunctival ulcers. Corneal involvement is not reliable; however some cats develop corneal ulcers which are transiently dendritic at the very earliest phase only. These dendrites quickly coalesce to become geographic ulcers. The ocular signs are seen in association with typical signs of upper respiratory infection. The uncomplicated clinical course is typically 10-14 days; however it is critical to realize that almost all cats become latently infected within ganglia for life. Reactivation from latency is likely in at least 50% of cats, sometimes with viral shedding.

Recrudescent FHV-1 Syndromes

Despite the frequency with which latently infected cats undergo viral reactivation at the ganglia and viral shedding at peripheral epithelial sites, recrudescent disease occurs in a minority of these. Further, disease severity and tissue involvement can range very widely between individuals and even between episodes in the same cat. Recrudescent conjunctivitis is usually milder than in acute infections, but can become chronic and "smoldering". Although recrudescent conjunctivitis is usually nonulcerative, substantial conjunctival thickening and hyperemia can occur secondary to inflammatory cell infiltration. Corneal involvement is relatively frequent in recrudescent disease compared to primary infection and may involve the corneal epithelium or stroma. With epithelial involvement, dendritic and later geographic corneal ulceration may be seen just as in primary infections. Corneal stromal disease is typically immunopathological (i.e., immune-mediated, but not necessarily autoimmune) in origin and includes stromal neovascularization, edema, stromal cell infiltration, and ultimately fibrosis usually under an intact epithelium. Consensus has not been reached regarding the antigens

responsible for the subepithelial immunological response within cornea and/or conjunctiva. Some believe the process is driven by viral antigens, while others are suspicious that altered self antigens are the focus of the immunological response.

FHV-1-Associated Disease Syndromes

The following diseases have been associated with detection of FHV-1 in affected tissues; however the causative role of the virus in each syndrome has been variably proven.

Symblepharon. There is little question that symblepharon can be a sequela to severe primary FHV-1 infection. It is commonly seen in young animals, and presumably occurs as a result of widespread ulceration with exposure of the conjunctival substantia propria and sometimes also the corneal stroma. FHV-1 is almost certainly the predominant cause of symblepharon formation in cats and other infectious agents are unlikely to cause symblepharon formation.

Corneal sequestration. Experimentally, FHV-1 inoculation (in cats receiving corticosteroids) can result in corneal sequestration. However, the prevalence of detectable FHV-1 in samples collected from cats with sequestra has varied widely in the clinical setting and the link between FHV-1 and sequestra has not been shown to be causative. It seems likely that sequestration is a non-specific response to stromal exposure or damage and that FHV-1 is just one possible cause of this disease. This is borne out in a study by Nasisse et al who reported identification of FHV-1 DNA in 86 of 156 (55%) of sequestra analyzed (compared with only 6% of clinically normal corneas). A lower prevalence of FHV-1 DNA was found in corneas of Persian and Himalayan cats with sequestration, suggesting that other non-viral causes of sequestration are more likely to be operative in these breeds.

Eosinophilic keratitis. Prior clinical studies have suggested a link between FHV-1 infection and eosinophilic keratitis. PCR testing of corneal scrapings from cats with cytology-confirmed eosinophilic keratitis has revealed 76% (45/59) of cases to be FHV-1 positive. However, PCR performed on tears collected onto a STT was negative in 10 cats with cytologically proven eosinophilic keratitis. As with corneal sequestra, the role of the virus in the initiation or exacerbation of this disease has not been determined; however anecdotally some patients with this syndrome improve with antiviral therapy alone.

Uveitis. HSV-1 is a well-documented cause of uveitis in humans. Given the shared biological behavior of the alphaherpesviruses, we examined the role of FHV-1 in feline uveitis. The PCR assay was used to demonstrate FHV-1 DNA in the aqueous humor of 12/86 cats; all but one of which had uveitis. The same study also used ELISA to examine FHV-1-specific antibody concentrations in aqueous humor and serum. While seropositivity did not vary among cats, intraocular antibody production, as determined by a Goldman-Witmer coefficient (C-value) > 1, was detected only in cats with uveitis. Additionally, a C-value > 8, which is frequently quoted as a more clinically useful indicator of intraocular antibody production, was found only in cats with idiopathic uveitis. This information suggests that FHV-1 can infect the intraocular compartment and that, at least in some cats, it stimulates a specific and local antibody response. Because the trigeminal nerve supplies the uveal tract, it is possible that virus may reactivate spontaneously or via induction and arrive in the uvea (and aqueous humor) by the "round trip theory", as for surface ocular disease. Viral pathogenic mechanisms similar to those reported in surface disease

are therefore plausible explanations for the uveal pathology seen. That is, virally mediated cytolysis and immunopathological responses directed at auto or viral antigens are both possible. However, proving a casual association remains difficult.

Dermatitis. Periodically, FHV-1 has been identified as a cause of dermatological lesions, particularly those surrounding the eyes and involving nasal skin of domestic and wild felidae. This is not surprising when one considers the marked epithelial tropism of this virus and the reliability with which HSV-1 causes dermal lesions. We have recently examined the diagnostic utility of FHV-1 PCR for this disease. FHV-1 DNA was detected in all 9 biopsy specimens from 5 cats with herpetic dermatitis but in 1 of 17 biopsy specimens from the 14 cats with nonherpetic dermatitis, and was not detected in any of the 21 biopsy specimens from the 8 cats without dermatitis. This is in sharp contrast to the use of this technique in ocular tissues where the extent of viral shedding in normal animals dramatically reduces the sensitivity of a positive test in affected animals. When results of histologic examination were used as the gold standard in this study of cats with dermatitis, sensitivity and specificity of the PCR assay were 100% and 95%, respectively. We concluded that FHV-1 DNA can be detected in the skin of cats with herpetic dermatitis, that the virus may play a causative role in the disease, and that this PCR assay may be useful in confirming a diagnosis of herpetic dermatitis.

DIAGNOSIS OF HERPETIC OCULAR DISEASE

A major paradox exists with respect to the diagnosis of FHV-1. Cats experiencing primary FHV-1 infection shed virus in sufficient quantities that viral detection is relatively easy. However, clinical signs during this phase of infection tend to be characteristic and self limiting, making definitive diagnosis less necessary. By contrast, during the more chronic FHV-1-associated syndromes, the diversity and ambiguity of clinical signs make viral identification more desirable, especially if specific antiviral therapy is being considered. However, the elusive nature of the virus in these chronic syndromes makes detection difficult. This is compounded by viral detection in normal animals. Indeed, the diagnosis of FHV-1 in individual cats represents one of the greatest challenges in the management of chronic herpetic diseases.

Although the extreme sensitivity (and specificity) of PCR has improved detection of virus, it has also confirmed that virus can be demonstrated in up to half of apparently normal cats. This must be considered when interpreting results of diagnostic assays in individual cats with disease. Additionally, we know that HSV-1 (and therefore possibly FHV-1) can be stimulated to reactivate by irritation of the peripheral sensory neurons. Therefore, it is possible that virus detected at a peripheral site in a diseased animal may be there as a *result* rather than a *cause* of the disease being investigated. Finally, no test in common usage can differentiate vaccine from wild-type virus. Therefore, there are at least 4 possible explanations when virus is detected in a cat with disease:

1. Its presence is *coincidental* (i.e., unrelated to the primary disease process)
2. Its presence is a *consequence* of the primary disease process
3. It is the *cause* of the primary disease process
4. It is *vaccine* virus

Even if virus is found, the clinician must consider whether specific antiviral treatment is warranted regardless of whether the virus is there as a cause or effect of the primary disease process. Currently, other than clinical acumen, there is no "test" that will answer that question!

Perhaps one of the best ways to diagnose FHV-1 is to maintain a strong clinical suspicion of its involvement in any cat with surface ocular disease and to be well aware of its classical clinical features, but to be questioning of its role in that disease process whenever it is detected using any currently available diagnostic assays.

For this reason, defining the "diagnostic" clinical signs is important. The only pathognomonic clinical sign of herpetic infection is the presence of dendritic corneal lesions. However, these are unreliably and transiently present, and although they may be fluorescein positive, are sometimes detectable only with rose bengal stain. Dendritic stromal scars that fail to retain fluorescein or rose bengal stains are also sometimes seen. Despite this, there are ways to create a high clinical suspicion of herpetic disease in cats. This starts by acknowledging that the vast majority of feline keratoconjunctivitis is due to FHV-1 or *Chlamydophila felis* (previously *Chlamydia psittaci*). Feline calicivirus is an unlikely and minor primary conjunctival pathogen and is not a recognized corneal pathogen. Data presented in the table is intended to assist with the distinction of these two major differential diagnoses for any cat with keratoconjunctivitis. Differentiation of chronic or recurrent syndromes is more difficult than primary syndromes.

Clinical Signs	FHV-1	FCV	Chlamydia
Malaise/Anorexia	+++	++	+/-
Sneezing	+++	+	++
Nasal Discharge	+++	++	++
Oral Ulceration	-	+++	-
Ptyalism	+	+++	+/-
Ocular Discharge	+++	+	++
Conjunctivitis	+++ (Hyperemic)	-	+++ (Chemotic)
Keratitis	+++	-	-

Feline Herpes Virus - The Latest in Antiviral Therapy

FELINE HERPES VIRUS — THE LATEST IN ANTIVIRAL THERAPY

David J. Maggs BVSc(hons) Diplomate ACVO
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I like to think of therapy for cats infected with FHV-1 as falling into one of three categories: supportive therapy, R&D antiviral therapy, therapies still undergoing investigation and contraindicated therapies. For brevity, I have emphasized the latter 3 categories here.

ANTIVIRAL AGENTS

FHV-1 is variably susceptible to inhibition by all commercially available antiviral ophthalmic medications studied thus far, however the safety of these compounds is not readily predicted from their behavior in humans and their efficacy against FHV-1 often does not correlate with their activity against other viruses (even closely related viruses like HSV-1 and -2).

For these reasons, careful *in vitro* investigation of efficacy against FHV-1, followed by safety and pharmacokinetic trials, subsequent placebo-controlled efficacy studies in experimental animals, and finally judicious clinical trials in client-owned animals should always precede widespread clinical use and anecdotal reporting.

Some important general concepts about antiviral agents assist with selection and expectations of this class of drugs:

- Because viruses reside intracellularly and utilize host cellular machinery, antiviral agents tend to exhibit greater host toxicity than antibacterial drugs. This rarely limits topical application of these drugs but may severely limit their systemic use.
- Most antiviral agents in common use are virostatic, therefore they require relatively frequent dosing or topical application. In some cases hourly application of ophthalmic preparations is recommended for at least the first 24 hours of therapy in humans.
- No antiviral drug is antibacterial
- Antiviral drugs safe in humans are not necessarily safe in cats
- Antiviral drugs effective against human herpesviruses are not necessarily effective against FHV-1
- Antiviral prodrugs metabolized to their active form by humans are not predictably metabolized by cats

The effect of some antiviral drugs on FHV-1 replication *in vitro* has been studied and their relative potency reported (see **Table**).

	TFU	GCV	IDU	Cidofovir	PCV	Vidarabine	ACV	Foscarnet
IC_{50} FHV-1 (μM)	0.67	5.2	4.3-6.8	11.0	13.9	21.4	57.9-85.6	232.9
IC_{50} HSV-1 (μM)	1.7	0.77	1.0	9.3	2.3	3.5	1.2	74.18

Relative *In vitro* efficacy against FHV-1 and HSV-1 of commercially available antiviral drugs (*Lower* IC_{50} = *more* effective)

The following antiviral agents have been studied to varying degrees for their efficacy against FHV-1, their pharmacokinetics in cats, and/or their safety and efficacy in treating cats infected with FHV-1.

Idoxuridine (IDU) is a nonspecific inhibitor of DNA synthesis, affecting any process requiring thymidine. Therefore, host cells and viruses are similarly affected, systemic therapy is not possible, and corneal toxicity can occur. It has been used as an ophthalmic 0.1% solution or 0.5% ointment. This drug is reasonably well tolerated by most cats and seems efficacious in many. It is no longer commercially available in the USA but can be obtained from a compounding pharmacist. It should be applied to the affected eye 5-6 times daily.

Vidarabine, like idoxuridine, is non-selective in its effect and so is associated with notable host toxicity if administered systemically. Because it affects a viral replication step different from that targeted by idoxuridine, vidarabine may be effective in patients whose disease seems resistant to idoxuridine. As a 3% ophthalmic ointment, vidarabine often appears to be better tolerated than many of the antiviral solutions. Where it is not available commercially, it can be obtained from a compounding pharmacist. Like idoxuridine, it should be applied to the affected eye 5-6 times daily.

Trifluridine (Viroptic® or generic) is an analogue of thymidine whose specific mechanism of action against HSV-1 (for which it was developed) or FHV-1 is not completely understood. It is too toxic to be administered systemically but topically administered trifluridine is considered one of the most effective drugs for treating HSV-1 keratitis; in part due to its superior corneal epithelial penetration. It is also the most potent antiviral drug tested so far for FHV-1. It is commercially available in the USA as a 1% ophthalmic solution that should be applied to the affected eye 5-6 times daily. Its clinical efficacy is somewhat unpredictable, it is expensive, and frequently irritating. It too requires very frequent application.

Acyclovir (Zovirax®) is the prototype of a group of antiviral drugs known as acyclic nucleoside analogues. Members of this group of antiviral agents all require 3 phosphorylation steps for activation. The first of these steps must be catalyzed by a viral

enzyme, thymidine kinase. This fact increases their safety and permits them to be systemically administered to humans. However, the activity of this enzyme in FHV-1 has not been verified. This may explain why the IC_{50} reported for acyclovir against FHV-1 is much higher than that reported for HSV-1. The second and third phosphorylation steps must be performed by host enzymes, which may not be present in cats or may not be as effective in cats as they are in humans. In addition to relatively low antiviral potency against FHV-1, acyclovir has poor bioavailability and is potentially toxic when systemically administered to cats. Oral administration of 50 mg/kg acyclovir to cats was associated with peak plasma levels of only 33 μM (approximately one third the IC_{50} for this virus). Common signs of toxicity are referable to bone marrow suppression, therefore it appears wise to monitor a CBC in patients receiving acyclovir systemically.

Valacyclovir (Valtrex®) is a prodrug of acyclovir that, in humans and cats, is more efficiently absorbed from the gastrointestinal tract compared with acyclovir and is converted to acyclovir by a hepatic hydrolase. Plasma concentrations of acyclovir that surpass the IC_{50} for FHV-1 can be achieved after oral administration of this drug. However, in cats experimentally infected with FHV-1, valacyclovir induced fatal hepatic and renal necrosis, along with bone marrow suppression, and did not reduce viral shedding or clinical disease severity. Therefore, despite its superior pharmacokinetics, valacyclovir should **not** be used in FHV-1-infected cats.

Penciclovir is another acyclic nucleoside analogue and potent antiviral activity against a number of human herpesviruses and FHV-1. It is available as a dermatologic cream for humans that should not be applied to the eye. Although there are some data regarding administration of famciclovir to cats (which is converted to penciclovir), in vivo studies of penciclovir's safety or efficacy in cats are lacking and at this time, its use in cats cannot be recommended.

Famciclovir is a prodrug of penciclovir; however metabolism of famciclovir to penciclovir in humans is complex and requires di-deacetylation, predominantly in the blood, and subsequent oxidation to penciclovir by aldehyde oxidase in the liver. Unfortunately, hepatic aldehyde oxidase activity is nearly absent in cats. This has necessitated cautious extrapolation to cats of data generated in humans. In a recent study of famciclovir pharmacokinetics in normal cats given 9-18 mg/kg q 8-12 hours, peak plasma penciclovir concentrations achieved were approximately 1/5th the concentration required for in vitro activity against feline herpesvirus-1. In a subsequent study cats given 90 mg/kg TID achieved plasma concentrations that were surprisingly low (approximately 2/3 of IC_{50}). Taken together, data from these two studies suggest that the pharmacokinetics of famciclovir in cats are extremely complex and require more work. However, in a masked, prospective, placebo-controlled study of efficacy, experimentally infected cats receiving 90 mg/kg famciclovir TID had significantly reduced clinical signs and serum FHV-1 titers than did placebo-treated cats. No clinically important adverse physical, hematologic or biochemical changes were associated with famciclovir administration. Despite this, there are anecdotal reports that suggest famciclovir is effective in some cats with suspected herpetic disease at lower doses and dose frequency.

Further studies of the pharmacokinetics, safety and efficacy of famciclovir and penciclovir are required before dose rates and frequency can be recommended.

Cidofovir is a cytosine analogue that requires 2 host-mediated phosphorylation steps but does not require virally-mediated phosphorylation. Its safety arises from its relatively high affinity for viral DNA polymerase compared with human DNA polymerase. Its metabolites also appear to have a particularly long tissue half-life suggesting less frequent application may be possible. It is available in injectable form in the United States but has been compounded for topical application as a 0.5% solution. In a recent study, twice daily topical application to cats experimentally infected with FHV-1 was associated with reduced viral shedding and clinical disease. There are occasional reports of its experimental topical use in humans being associated with stenosis of the nasolacrimal drainage system components and, as yet, it is not commercially available as an ophthalmic agent in humans. Therefore, although its in vitro and short-term in vivo efficacy against FHV-1 are proven, at this stage there are insufficient data to support its long term safety as a topical agent in cats.

AGENTS WITH POTENTIAL ANTIVIRAL ACTIVITY

Lysine: Interest in the potential suppressive effects of orally administered lysine on FHV-1 replication in cats arises from several *in vitro* and clinical trials suggesting that arginine is an essential amino acid for viral replication, and that lysine may antagonize arginine availability or utilization by the virus at numerous levels. We have recently shown that, in the presence of diminished arginine concentrations, i*n vitro* replication of FHV-1 was suppressed by approximately 80% when the lysine concentration in the culture medium was doubled. This effect was negated at higher arginine concentrations, which suggests a similar mechanism of arginine antagonism to that described for HSV-1. The requirement for a high lysine-to-arginine ratio for in vitro efficacy, along with the fact that humans involved in clinical trials were required to limit their arginine intake, raised some concern regarding application of this treatment to cats, since they are exquisitely sensitive to arginine deficiency. However, the safety and efficacy of 500 mg lysine PO BID to cats (beginning 6 hours prior to experimental inoculation with FHV-1) was associated with less severe conjunctivitis than cats receiving placebo. However, viral shedding, as determined by VI, did not differ between groups. Subsequently, we demonstrated that oral lysine supplementation helps to prevent viral reactivation and/or shedding in latently infected cats. Despite significant elevations in plasma lysine concentration, no change in plasma arginine concentration or any ill effects attributable to lysine administration were observed in either study.

Once or twice daily bolus administration of lysine is often impractical, especially long term. Therefore, we studied the safety and efficacy of incorporating lysine into cat food. Results of an initial safety trial were encouraging. Cats fed a diet supplemented with up to 8.6% (dry matter) lysine showed no signs of toxicity, had normal plasma arginine concentrations, and had normal food intake. Mean plasma lysine concentration of these cats was increased to levels similar to that achieved with bolus administration. In a subsequent study, 25 cats with enzootic upper respiratory tract disease were fed a diet

supplemented to 5.1% lysine while 25 cats remained on a basal ration for 52 days following rehousing intended to cause viral reactivation. Ironically, food (and therefore lysine) intake decreased coincident with peak disease and viral presence. As a result, cats did not receive lysine at the very time they needed it most. Perhaps because of this, disease in cats fed the supplemented ration was more severe than that in cats fed the basal diet. In addition, viral shedding was more frequent in cats receiving the supplemented diet. On the basis of these data, dietary lysine supplementation cannot be recommended at this stage. Based on all of these studies, I currently recommend cats receive 500 mg L-lysine PO q 12 hours.

λ-carrageenan is a red seaweed extract containing sulfated polysaccharides with demonstrated antiviral activity against numerous enveloped viruses including FHV-1 but only when used prior to viral adsorption. It was well tolerated when applied topically 4 times per day in normal cats. However, it was ineffective in experimentally infected cats when 1 drop of a 250 μg/mL solution of λ-carrageenan was applied before and after infection (n = 6 cats) or after infection only (n = 6 cats).

Leflunomide is an immunosuppressive agent that appears to have some in vitro antiviral effects against many herpesviruses including FHV-1. The proposed method of action is through alteration in outer tegument formation. In vivo studies are required.

Lactoferrin is a mammalian iron-binding glycoprotein that has antibacterial, antifungal, antiprotozoal, and antiviral properties. It is produced by mucosal epithelial cells of many mammalian species and is present in secretions such as tears. Lactoferrin has a very potent antiviral effect against FHV-1 replication in vitro apparently through inhibition of FHV-1 adsorption to the cell surface and/or penetration of the virus into the cell.

The interferons are a group of cytokines that have diverse immunological and antiviral functions. Interferons are divided into 4 groups; α, β, γ, and ω interferons, and numerous subtypes. Viral infection stimulates cells to secrete IFN into the extracellular space. Interferon then binds to specific receptors on neighboring cells, and through mechanisms not fully understood, prevents or limits the cell-to-cell spread of infection.

Although interferons may play important physiological roles in the control of viral infections, in vitro and clinical trials attempting to elucidate potential therapeutic applications have produced conflicting results. In vitro application of recombinant human IFNα or recombinant feline IFNω significantly reduced FHV-1 titer and/or cytopathic effect while not producing any detectable cytotoxic changes in the host cell lines. At higher concentrations, the effect the recombinant feline IFNω was greater than that of IFNα. In a separate in vitro study, acyclovir combined with human recombinant IFNα was associated with a nearly eightfold reduction in the dose of acyclovir required to achieve maximal inhibition of FHV-1 without increased cytotoxicity. Significant synergistic interactions resulted when the IFNα was given before or after infection at the lower doses of acyclovir; however IFNα pretreatment was more effective.

There are relatively few peer-reviewed, placebo-controlled, prospective clinical trials of IFN administration in cats. One study utilized 10,000 IU recombinant feline IFNω administered OU q 12 hours and 2,000 IU administered PO q 24 hours. IFN administration was initiated 2 days prior to viral inoculation but was not continued after inoculation. No beneficial effects were shown. In a separate study, systemic administration of IFNα (10^8 IU/kg subcutaneously BID beginning 1 day prior to inoculation) did not prevent disease, but cumulative clinical scores were lower for cats treated with IFNα. An abstract has also been presented detailing preliminary low-dose data comparing 1, 5 or 25 IU IFNα administered PO q 24 hrs to cats undergoing primary experimental FHV-1 infection. In this study IFN was given after viral challenge only; 24 and 48 hours post inoculation. Scores for disease severity were significantly lower in cats receiving 5 or 25 units than in control cats. Given the relative lack of controlled studies and the variability in methodology and outcome in the few studies to date, further research is necessary to determine dosage, timing, and efficacy (if any) of this group of compounds, especially in the more chronic or recrudescent infections seen most commonly by ophthalmologists.

CONTRAINDICATED THERAPY

Anti-inflammatory therapy has relative or, in some circumstances, absolute contraindications in cats with herpetic disease, especially those undergoing primary infection and use of such agents remains controversial in the management of FHV-1 infections. However, a return to basic virology and a review of the literature makes some general comments possible. FHV-1 produces disease by at least 2 very different mechanisms that require markedly different (in fact, almost opposite) therapeutic approaches. Cytolytic infection represents active viral replication and is often ulcerative. Immunomodulation at this point is almost certainly contraindicated. By contrast, immunopathological (or immune-mediated) injury is mediated by host inflammatory responses and driven" by persistent viral antigen and/or autoimmunity.

Systemic administration of **corticosteroids** is a well-established and reliable means of inducing viral reactivation from latency. This must be considered whenever these drugs are considered in the clinical management of FHV-1-infected cats. The ability of locally-administered corticosteroids to exacerbate self-limiting primary conjunctival infection and to sometimes induce chronic herpetic keratitis has also been well established. Complications seen in corticosteroid treated eyes included deeper and more persistent corneal ulcers, corneal edema, corneal vascularization, sequestrum or band keratopathy formation, and protracted viral shedding. Topical corticosteroids are therefore contraindicated in primary ocular FHV-1 infection.

The potential complications from using corticosteroids have prompted interest in the use of **non-steroidal anti-inflammatory drugs (NSAIDs)** for managing the inflammatory effects of ocular FHV-1 infection. Although there are no studies of their effects in cats infected with FHV-1, they are known to have similar negative effects to corticosteroids in humans and experimental studies investigating HSV-1. **Cyclosporine** is capable of suppressing inflammatory events operative in viral stromal keratitis, but also impairs viral

clearance from the eye and suppresses some beneficial immune responses. *In vitro*, cyclosporine exerts a dose dependent effect on HSV-1 replication. In some experimental model systems, however, cyclosporine therapy resulted in more severe and persistent keratitis. In a recent clinical trial, cyclosporine and trifluridine were used in combination to treat HSK in humans with good results. Use of cyclosporine in chronic feline herpetic disease has been inadequately studied and I am unaware of any studies examining the effects of **tacrolimus** on ocular herpetic infections in any species. This suggests that use of these agents should, as a minimum, be restricted by the same principles that govern the use of corticosteroids in HSK.

NASAL DISCHARGE AND SNEEZING IN THE CAT

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Acute or chronic upper respiratory tract disease results in significant morbidity in the feline population. Commonly implicated causes include feline herpes virus (FHV-1), feline calicivirus (FCV), and bacteria such as *Mycoplasma*, *Bordetella*, and *Chlamydophila*. Determining an etiologic diagnosis in acute or chronic feline upper respiratory tract disease is difficult. Various diagnostic methods, such as virus isolation, fluorescent antibody titers, serum neutralizing antibody titer, and detection of viral DNA with PCR have been used to confirm exposure to FHV-1 or calicivirus, however, there is not a recognizable correlation between test result and disease state. Both viruses can exist in a carrier state in the cat and animals can shed virus during period of stress. *Mycoplasma* and *Bordetella* can be isolated from healthy cats, and it remains difficult to associate specific disease processes with detection of an organism.

Chronic rhinosinusitis in the cat is characterized by intermittent, recurrent episodes of sneezing and nasal discharge. Partial response to antibiotic therapy is common, which supports a role for secondary bacterial infection in the pathogenesis of disease. Mucopurulent or hemorrhagic nasal secretions are typical, and disease can be unilateral or bilateral. Clinical signs likely result from a process within the nasal cavity that results in loss of normal nasal immunity and activation of mucus producing glands. The initiating factor may be viral infection or immunopathology resulting from a host-pathogen inter-relationship. Disease might also result from pathology associated with secondary bacterial invaders. In cats with chronic idiopathic rhinosinusitis, it is rare to determine a single etiologic agent that can be specifically treated and cleared from the body. Loss of normal turbinate structures and hypertrophy of mucous glands result in loss of normal nasal function and continual mucus production. Because clinical signs mimic a number of other disease conditions (foreign body inhalation, dental related nasal disease, neoplasia, fungal infection), a complete diagnostic work-up with evaluation of the nasal cavity is indicated to rule out treatable conditions.

A minimum database (CBC, chemistry, urinalysis) and screening for FeLV/FIV are used to assess the general health of the cat and are usually normal. Imaging is performed under general anesthesia prior to intranasal inspection. When skull radiographs are performed, the intra-oral view is most helpful in determining turbinate lysis or increased fluid density within the nasal cavity. Disease is usually bilateral but some cases are remarkably unilateral and can resemble nasal neoplasia in the distribution of lesions and in radiographic findings. Bony lysis, turbinate destruction, bullous effusion, and sinus involvement can be seen with either disease process. Computed tomography has supplanted radiography for evaluation of nasal structures in most referral institutions because additional detail can be obtained with cross-sectional imaging. Evaluation of

frontal sinuses, sphenopalatine sinuses, the middle ear, cribriform plate, and the nasopharynx are improved with CT. CT changes of neoplasia and rhinitis share similar characteristics, however CT does provide a better assessment of the extent of disease.

Imaging is used to localize the severity of the disease process and to guide intranasal sampling through rhinoscopy. When performing rhinoscopy in the cat, caudal rhinoscopy (examination of the nasopharynx) is recommended first in order to rule out the possibility of nasopharyngeal stenosis and to detect mass lesions. A flexible endoscope (~5mm outer diameter) provides the best means for examining the nasopharynx. The endoscope is inserted into the mouth beyond the edge of the soft palate, and the tip is deflected maximally to place the end of the scope above the soft palate in the nasopharynx. The resultant image is upside down and backwards.

Rostral rhinoscopy can be performed with either an otoscope or rigid telescope (~2.8mm outer diameter works well). Chronic rhinitis is generally characterized by hyperemic mucosa, large amounts of mucoid to purulent discharge, and irregular turbinate structures, although changes viewed on rhinoscopy do not necessarily correlate with the severity of histologic inflammation. Destructive rhinitis is evident as increased space between the turbinates. Biopsy specimens typically show nonspecific changes such as fibrosis, necrosis, inflammation, and glandular hyperplasia, however they are generally useful in distinguishing inflammation from neoplasia or fungal infection. Deep nasal swabs or biopsy specimens can be collected for bacterial culture and are sometimes helpful in guiding antibiotic therapy for secondary bacterial rhinitis, however potential pathogens† must be distinguished from respiratory flora.

Control cats	Cats with rhinitis
No growth	†*Pasteurella multocida* 1+ *Staphylococcus* 1+
No growth	†*E. coli* 1+ †*Peptostreptococcus anaerobius* 1+ †*Bacteroides fragilis* 1+
Staphylococcus 3+ †*Streptococcus viridans* 3+	†*Bacteroides/Prevotella* 4+ †*Fusobacterium nucleatum* 4+ †*Peptostreptococcus anaerobius* 4+
	Staphylococcus 1+
Staphylococcus 2+	†*Corynebacterium ulcerans* 1+
Staphylococcus 2+	†*Pasteurella multocida* 2+ †*Bordetella bronchiseptica* 2+ †*Streptococcus viridans* 2+ †Non-fermenter Group 3 2+ †*Mycoplasma felis* 4+
No growth	†*Pseudomonas aeruginosa* 2+
	†*Actinomyces slackii* 1+ †*Bacteroides ureolyticus* 3+
	No growth
	†*Pasteurella multocida* 1+ †*Mycoplasma felis* 1+

From LR Johnson et al, JAVMA 2005; 227: 579

Chronic antibiotic therapy is variably helpful in controlling secondary bacterial rhinitis. Commonly used antibiotics include doxycycline, cephalexin, amoxicillin-clavulanic acid, clindamycin, enrofloxacin, and azithromycin. If the cat responds to an initial 10-14 day course of therapy, treatment should be continued for at least 3-6 weeks. Following this, intermittent or suppressive drug therapy may be required. Resistance to antibacterial action occurs commonly. Topical decongestants are not generally effective due to an inability to penetrate purulent nasal discharge to contact the epithelium, and oral agents may actually worsen signs by drying out respiratory secretions. The nares should be kept free of dried exudate to improve breathing and smell.

Control of nasal inflammation can sometimes be achieved with the use of piroxicam at 0.3 mg/kg PO daily or every other day. Drug compounding is required as this drug is available as a 10 mg caplet for humans. This nonsteroidal anti-inflammatory agent can result in subclinical gastric erosion and can reduce renal function. Caution is warranted when using it in older animals or in cats with renal insufficiency. Corticosteroids are well known for their ability to reduce inflammation and to decrease mucus production. Because rhinosinusitis is a disease characterized by exuberant inflammation and by accumulation of viscid mucus, steroids are often considered as a treatment option in affected cats. Cats are quite tolerant of oral steroids, and it is possible that steroids could lessen clinical signs, except in the cases where active herpesvirus infection has been confirmed or when it is considered highly likely (based on the presence of dendritic ulcers, corneal sequestrum, or concurrent facial dermatitis, for example). Steroids can also worsen disease in cats that have nasal fungal infections and can make the diagnosis of lymphoma more difficult. Therefore, diagnostic testing should be completed prior to use of steroids.

In human medicine, intranasal steroids are widely used for treatment of sino-nasal disease. These sprays are designed to be inhaled actively in order to aspirate drug deep into the sinuses. Cats do not tolerate this application well and penetration of the spray to the level of the mucosa is poor when thick mucoid material fills the nasal cavity. Metered dose inhalers with spacing chambers are sometimes advocated for treatment of chronic rhinosinusitis, however MDIs are designed to deliver small particles to the lower airways rather than deposit material in the upper airways, and it is unclear whether they are effective in nasal disease.

To encourage removal of mucus, oral N-acetylcysteine can be considered. This agent acts as an anti-oxidant and also has mucolytic properties. An oral preparation is available in health food stores or on the internet as 400, 500, or 600 mg tablets and cats appear to tolerate 100-250 mg PO BID. In addition, nebulization or aerosolization with sterile saline can be helpful for hydrating the nasal cavity. This is generally better tolerated than instillation of saline nasal drops, but either technique can be helpful. For severe and refractory cases of

sinonasal disease, repeat bouts of anesthesia with intubation and nasal flushing may be helpful in improving quality of life.

Because the contribution of viruses such as FHV-1 to disease state has not been determined, it is unclear whether specific anti-viral therapy would be of benefit in these cats. However a 1-month trial on lysine supplementation (500 mg PO twice daily) could be considered as therapy for FHV-1 related disease.

Cats with chronic destructive rhinitis have a guarded prognosis for resolution of disease. Sneezing and mucopurulent discharge are difficult to control and impossible to eradicate. Signs may abate somewhat with antibiotic therapy but they always recur. Surgical therapy may be considered when medical therapy fails to control signs to a reasonable extent. Turbinectomy with frontal sinus obliteration and implantation of a fat graft or polymethylmethacrylate bone cement is an aggressive attempt at controlling clinical signs. Sneezing and nasal discharge may not be totally obliterated with this technique, although improvement can be seen in certain cases. The procedure is technically difficult to perform and may be associated with complications such as hemorrhage intra-operatively and persistent anorexia due to loss of smell.

Nasopharyngeal stenosis

The opening to the caudal nasopharynx is normally >5-6 mm across and may be reduced to less than 1mm by a web of scar tissue spanning the opening to the caudal nasopharynx. This tissue might represent a congenital malformation or a response to chronic inflammation associated with chronic upper respiratory disease or regurgitation into the nasopharynx. The condition is characterized by formation of a tough fibrous membrane across the caudal opening of the nares.

Signs associated with nasopharyngeal stenosis may be classic for upper respiratory infection, with sneezing, stertor, and mucopurulent nasal discharge. However, signs due to nasal obstruction usually predominate, and most cases lack nasal discharge. Stertorous respiration or snoring sounds are commonly reported. Respiratory distress occurs in these cats when nasal breathing is required. Signs that can be alleviated by open mouth breathing localize the abnormality to bilateral nasal passages or the nasopharynx.

Occasionally, a tissue malformation in the choanal region can be visualized on CT with sagittal reconstruction of the image. Nasopharyngeal stenosis is most easily diagnosed using a flexible endoscope to obtain a view of the nasopharynx. The nasopharynx in normal animals is continuous with the oropharynx, and the region can be indirectly evaluated by passing a 3 - 5 French catheter caudally through the ventral meatus. In the normal cat, this should pass easily into the pharynx, however a stenosed region will block passage of the catheter in affected cats. The investigator must have an appreciation of the normal anatomy of the caudal nasopharynx to recognize this syndrome. Therefore, it is worthwhile to

include a view of the caudal nasopharynx in the work-up of any cat with upper respiratory disease.

Treatment of this obstructive breathing disorder requires surgical resection since the membrane is too thick to be broken down manually or with a catheter. The approach to the caudal nasopharynx is through a midline incision in the soft palate. Iris scissors can be used to excise the nasopharyngeal membrane. Alternately, balloon dilation of the region can be performed, although several episodes may be required. Stent placement has also been successful in alleviating the obstruction.

Cryptococcus

Infection with the fungus, *Cryptococcus neoformans*, has been reported in all ages of cats, with most affected cats ranging from 6-9 years of age. Concurrent infection with FeLV or FIV is present in less than 25% of cases, and the presence of viral disease does not appear to impact the course of disease or response to therapy. Clinical signs include sneezing, ulcerated craterous skin lesions, a firm swelling on the nose or a mass protruding from the nose, chronic mucopurulent nasal discharge, ocular abnormalities, and CNS signs.

Diagnosis involves identification of a large, encapsulated fungal organism (up to 30µm) in cytology specimens from nasal exudate, tissue or lymph node aspirates, or biopsy impressions. The latex agglutination titer is a sensitive diagnostic test that detects the immune response to the capsular antigen of Cryptococcus. The latex agglutination titer can also be used to follow the course of disease and response to treatment. Collection of material for fungal culture is recommended by some investigators in order to allow epidemiologic studies on the spread of certain species,

Cryptococcosis is generally responsive to treatment with fluconazole or itraconazole, although long term therapy is generally required and up to 17% of cases may relapse after treatment. Itraconazole is dosed at 5 mg/kg PO SID-BID for formulated capsules and 1-1.5 mg/kg PO SID-BID for the liquid. Careful monitoring of both response to treatment (with repeated antigen titers) and for side effects of treatment is necessary. In particular, itraconazole has been associated with treatment limiting hepatotoxicity. Signs can be resolved in some cats by stopping the drug and reinstituting therapy at a lower dose, however other cats require a different drug. Itraconazole was reported to cure 57% of cases and to improve an additional 29% of cats in one study. The literature suggests that fluconazole (25-100 mg/cat daily) is most effective in treatment of cryptococcosis infections, with resolution of disease in 95% of cases. This drug is usually preferred if ocular involvement is documented because of better penetration of the blood ocular barrier. The drug is well tolerated and is currently available in an inexpensive generic formulation. If central nervous system involvement is suspected or confirmed based on physical examination, clinical signs, brain

imaging or CSF tap, fluconazole is usually used in combination with flucytosine. Flucytosine should not be used a sole therapy.

For cats that do not tolerate imidazoles, terbinafine (1/4 of a 250mg tablet once daily) can prove useful in treatment of disease. Alternately, amphotericin B, a cidal drug, can be use. Subcutaneous amphotericin B has successfully resolved cryptococcal infections. A dose of 0.5-0.8 mg/kg is diluted in 400-500 mls of 0.45% saline/2.5% dextrose and administered SQ 2-3 times weekly until cure (cumulative doses up to 26 mg/kg have been required). Renal function must be monitored throughout treatment, although a recent study found no decrement in renal function with the subcutaneous method of treatment.

Most studies indicate that resolution of disease follows a reduction in cryptococcal antigen titer. Effective treatment may require longer than 12 months, and cats with intranasal cryptococcosis may be less likely to achieve resolution of disease than those with cutaneous signs only. Cats that do not show a reduction in antigen titer over time are less likely to achieve resolution of disease. If the titer remains high, several options are available. Firstly, a search for immunosuppression should be repeated and compliance with drug administration insured. Culture and susceptibility testing for fungal organisms can be performed at the University of Texas Health Science Center, although the individual drug susceptibilities are expensive and in vitro findings do not necessarily correlate with in vivo response. Unfortunately, relapse of infection occurs in a relatively high percentage of cases (up to 17% in a recent study).

Nasal Aspergillosis

Cats with nasal aspergillosis can present to the clinic exactly like a cat with chronic rhinosinusitis, with recurrent bouts of mucopurulent nasal discharge (unilateral or bilateral), sneezing, and partial response to antibiotics. Unlike dogs, they do not develop depigmentation and they rarely have epistaxis or facial pain. They are also more likely to demonstrate obstruction of nasal airflow due to a granulomatous response in the nasal cavity or nasopharynx, contrary to dogs, which develop severe destructive rhinitis and increased nasal airflow.

Diagnosis of nasal aspergillosis in the cat is challenging. Serology is relatively insensitive in canine aspergillosis with many false negatives, and the few cats that have had titers performed have not developed positive titers. Computed tomographic features of canine aspergillosis are relatively characteristic, however the feline cases seem to resemble inflammatory rhinitis or neoplasia. Rhinoscopic visualization of fungal plaques has been most useful in the diagnosis in our hospital. Some cases have had granulomas in the nasal cavity while others have had fungal plaques only in the nasopharynx, highlighting the need to examine this area in all cats with nasal disease. While a flexible endoscope is most useful to achieve this exam, information can also be gained by performing a vigorous nasal

flush and collecting the material expelled. To perform a nasal flush, the animal is anesthetized and intubated and a moistened lap pad is packed gently in the oral cavity. A 35 cc syringe is filled with saline and inserted into the nostril for vigorous flushing. Occluding the contralateral nostril can encourage flow of fluid back through the nasaopharynx on onto the lab pad. The lap pad should be removed periodically, examined for exudative material, and replaced with a new moistened lap pad. The material collected should be submitted for histopathology or cytology to confirm the diagnosis. If cytology is performed, a wet mount using new methylene blue is preferred.

Treatment of feline nasal aspergillosis hasn't been fully evaluated. Local therapy with instillation of clotrimazole or enilconazole would be difficult in a cat. It appears that disease can be controlled in some cats with long-term itraconazole treatment as for treatment of cryptococcosis. It is likely that better response to treatment would be obtained with a new generation azole, voriconazole, although this drug is much more expensive and a dosing regimen has not been established.

Nasal Neoplasia

Nasal tumors represent a small percentage of neoplasms in cats, however the majority of cases exhibit malignant behavior through local invasion and extension. Tumor types encountered include lymphosarcoma, adenocarcinoma, squamous cell carcinoma, undifferentiated carcinoma, and fibrosarcoma.

Cats with nasal neoplasia present with clinical signs similar to those seen with other nasal disorders. Epistaxis or nasal discharge (unilateral or bilateral) is commonly seen along with sneezing or pawing at the face. On physical examination, loss of nasal airflow is a common finding. Facial deformity or a mass protruding from the nostrils is reported in 70% of cats with nasal tumors, and epiphora is also commonly seen. Neurologic signs such as seizures, behavioral changes, or cerebral dysfunction may be seen alone or in conjunction with respiratory signs. The presence of these signs is highly suggestive of tumor invasion into the central nervous system and warrants a guarded prognosis. Although the biologic behavior of most nasal tumors is characterized by local extension, metastasis to regional lymph nodes or to the lungs can occur and worsens prognosis.

The most common treatment for nasal neoplasia is radiation therapy. Concurrent chemotherapy is often employed for nasal lymphosarcoma. Median survival times reported are 9 - 23 months. Surgery alone does not palliate signs or result in increased survival. Side effects of radiation therapy are predictable and expected. If no early side effects are seen in normal tissue, it is unlikely that the dose administered was high enough to palliate the tumor. Early side effects of radiation therapy include mucositis, conjunctivitis, and moist desquamation of skin. Late effects of radiation therapy are generally irreversible. Radiation treatment

plans are designed to reduce the incidence of delayed side effects such as bone necrosis, cataracts, and keratoconjunctivitis

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THE COUGHING CAT

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Feline bronchial disease is a common cause of cough or respiratory difficulty in the cat population. The cause of this condition is not precisely known, although allergy, air pollution, oxidant injury, gastroesophageal reflux disease, and genetics may play a role. All ages of cats are affected, although middle-aged females (2-8 years) seem to be more frequently represented. Siamese cats seem to have an increased incidence of disease and may suffer from a more chronic form of bronchial disease. A spectrum of disease activity is encountered ranging from the cat that experiences intermittent coughing to the cat presented in life-threatening respiratory distress. The heterogeneous manifestations of disease are likely based in an inflammatory reaction within the airways. Reduction in airway diameter due to mucus production, epithelial hyperplasia, and airway smooth muscle constriction are responsible for the clinical signs of cough and/or respiratory distress seen in cats with bronchial disease. Airway remodeling in the chronic form of disease results in irreversible limitation of airflow.

Coughing or respiratory distress are the most frequently encountered complaints in cats with bronchial disease, and the duration of illness, severity of signs, and presence of other clinical abnormalities are variable. The cough is often described as a dry, 'hacking' cough, and paroxysms of coughing may be reported. Marked abdominal effort and coughing with the head and neck extended appears to be relatively common. Owners may report audible breathing sounds or wheezes that become progressively worse over time. Exercise intolerance can become evident in the later stages of disease, and the cat may limit its activity to lessen the stress on the respiratory system.

Cats with long-term bronchial disease may subsequently suffer from acute decompensation and attacks of bronchospasm that result in respiratory distress, or previously well cats may have a first time presentation for life threatening bronchoconstriction. It is difficult to identify cats that are at risk for the acute form of disease, however cats that require emergency treatment for asthma related attacks often suffer from recurrent episodes. Astute owners may recognize certain trigger events, such as exposure to smoke, perfume, or cleaning solutions, and they can develop strategies to prevent attacks.

On physical examination, cats with airway disease may appear normal at rest and can have normal pulmonary auscultation. However, these cats will usually display increased tracheal sensitivity, and post-tussive crackles can often be ausculted. Harsh lung sounds, crackles, or expiratory wheezes can be heard intermittently in affected cats, and the expiratory phase of respiration may be prolonged. Air trapping can occur distal to obstructed airways leading to a barrel

shaped chest. Auscultation in this area of the lung will be relatively quiet, and increased resonance is found on percussion.

Cats with bronchial disease or feline asthma will show variable changes on a CBC. Eosinophils are known to play an important role in airway inflammation, however peripheral eosinophilia is a variable finding in feline bronchial disease. A biochemical profile may reveal hyperproteinemia as a nonspecific indicator of chronic inflammation.

While idiopathic inflammation is the most common cause of cough in cats, specific disease processes can result in similar signs, and diagnostic testing should be performed to rule out treatable causes of airway inflammation such as parasitic infection or *Mycoplasma*. A cat with idiopathic inflammatory airway disease is likely to require life long and often daily treatment with glucocorticoids, and although cats generally tolerate steroid therapy well, there are systemic side effects. Therefore, if an inciting cause for inflammation can be identified and successfully treated, it might be more likely that the airway disease will resolve. Infection with the airway parasite *Aelurostrongylus abstrusus* has the potential to incite inflammation with subsequent bronchoconstriction. A cat can become infected with *Aelurostrongylus* by eating an infected snail or by eating a transport host (bird or rodent) that has eaten a snail. Although parasites are shed intermittently, fecal evaluation is a useful diagnostic tool, and is particularly recommended in a cat with a history of hunting or eating prey. A fresh, unrefrigerated fecal specimen (1 teaspoon) should be submitted for Baermann evaluation in order to detect the larval stage of this nematode. If infection with the parasite is possible, fenbendazole (50 mg/kg PO daily for 10-14 days) can be used to treat infection.

Feline heartworm disease has been recognized as a cause of both acute and chronic clinical signs of cough, particularly in combination with vomiting. The incidence and prevalence of feline heartworm disease as a clinical syndrome remain unclear, primarily because of the regional nature of the disease and its mosquito vector. It is important to remember that both indoor and outdoor cats can be infected with heartworm. The initiation of heartworm infection in the cat is similar to that in the dog, with deposition of L3 larvae under the skin followed by development into adult worms in the pulmonary artery approximately 5 months after infection. Most infections in the cat are occult, and microfilaremia is exceedingly rare. Antibody production can be detected within 3 months of infection, however a positive test indicates only exposure to disease. Heartworm antigen tests are more sensitive for documenting infection, however the antigen is produced only by the female heartworm, and a low worm burden is common in the cat. Interestingly, aberrant migration of heartworm larvae occurs more commonly in the cat than in the dog, and cerebral infection is a likely cause for sudden death in these cats. In addition, preliminary experimental studies suggest that larval forms of heartworm can incite pulmonary inflammation in infected cats.

Radiographic changes that characterize feline heartworm disease primarily involve the pulmonary vasculature rather than the cardiac silhouette, and caudal lobar arteries are generally enlarged. Cats with heartworm disease have been reported to have pulmonary artery enlargement, indicated by an artery that is greater than 1.6 times the size of the 9th rib on the left side. A variety of bronchointerstitial infiltrates can also be seen in cats with heartworm. Heartworm can be diagnosed on echocardiography by the presence of two parallel hyperechoic lines in the right ventricle or pulmonary artery.

Treatment of feline heartworm disease is generally symptomatic while waiting for the heartworms to die (generally within 2-3 years). The pulmonary hypersensitivity response is treated with prednisolone. Adulticidal therapy is not recommended because of the heightened sensitivity of cats to arsenicals. Aspirin therapy is apparently without benefit in infected cats. Monthly preventative medication against feline heartworm is safe and effective.

The signature roentgen finding in feline bronchial disease is peribronchial cuffing, however, normal chest radiographs can also be found. In addition, a variety of interstitial, bronchial, and alveolar infiltrative patterns can be observed varying from mild to severe. Alveolar infiltrates, including atelectasis of the right middle lung lobe, result from mucus plugging of larger airways with resultant collapse of distal alveolar segments. Other radiographic signs of feline bronchial disease include flattening of the diaphragm and air trapping or hyperlucency.

In select cases, thoracic CT provides an additional appreciation for the extent and severity of lung disease in affected cats. CT of the chest is most readily accomplished using a new generation helical unit that allows scanning of the entire chest within a single breath-hold (30-60 seconds). Slice thickness on the initial scan ranges from 3-7 mm. Animals are transported to the CT in sternal recumbency to avoid atelectasis. They are hyperventilated prior to the breath hold, which is accomplished at 15 cm water airway pressure. CT is very useful in defining the extent of airway obstruction in cats with chronic inflammatory airway disease or persistent pneumonia. It is also an excellent modality for detecting bronchiectasis, a potential sequelae to chronic bronchial inflammation, long before it is severe enough to appear on radiographs.

There are a variety of techniques that can be used to collect specimens from feline airways. Pre-treatment with terbutaline (orally or subcutaneously) for 24 hours prior to airway sampling seems to improve the safety of the procedure by lessening the bronchoconstrictive response. A transoral tracheal wash is a relatively benign technique that provides sufficient sample for cytologic analysis and bacterial culture. To perform a transoral tracheal wash, a sterile endotracheal tube and a sterile polypropylene or red rubber catheter (3.5-5 French) are needed. Prior to doing a tracheal wash, the catheter should be measured against the side of the animal to estimate the position of the carina. Passing the catheter too far distally can result in airway damage. The animal is anesthetized with a short-

acting anesthetic agent. Prior to intubation, the function of the larynx is assessed. Local lidocaine can be used in the cat to facilitate intubation. The sterile endotracheal tube is passed into the trachea, taking care to avoid touching the oral mucosa or larynx with the end of the tube in order to limit contamination with oropharyngeal bacteria. The cuff of the endotracheal tube does not need to be inflated for this short procedure, but an assistant should hold the tube in place to prevent the animal from aspirating it into the lower airway.

With the endotracheal tube held in place, the polypropylene or red rubber catheter is passed sterilely to the level of the carina, and the three-way stopcock with syringe is attached to the outer port. An aliquot of saline (4-6 mls) is instilled into the airway, and gentle suction is used to retrieve the fluid and cells from the lower airway. Removal of fluid can be enhanced by having the assistant compress the chest or by stimulating a cough during suction. If needed, the cuff on the endotracheal tube can be expanded to improve retrieval. Instillation and aspiration of fluid can be repeated several times until an adequate sample has been retrieved. A volume of 0.5-1.0 mls is usually sufficient for culture (aerobic and Mycoplasma) and cytology.

Alternately, bronchoscopy can be performed to collect a sample of airway fluid. Bronchoscopy also provides the following benefits: tracheal inflammation or irritation can be visualized; airway obstruction with mucus can be detected; structural changes in the lower airways (such as bronchiectasis or collapse) can be visualized; and foreign bodies can be identified and removed. The major drawbacks to bronchoscopy are the expense of the equipment and the need for special training in the procedure. Given the smaller size of airways in the cat, endoscopes < 3.8mm outer diameter are preferred. Contraindications for bronchoscopy center around the risks associated with general anesthesia such as worsening hypoxemia or exacerbation of cardiac arrhythmias.

An eosinophilic tracheal wash specimen should be considered supportive of the diagnosis of feline bronchial disease, however a large percentage of healthy cats have highly eosinophilic airway washes (up to 25% can be considered normal). Also, neutrophils predominate in many cases of feline bronchial disease and mixed inflammation is common.

Bacterial cultures are commonly obtained to rule out infection, although bacteria are rarely involved in airway disease of the cat. It is important to rule out *Mycoplasma* infection, which several studies have shown is a prominent cause of lower respiratory tract infection in cats. Positive qualitative airway cultures should be interpreted in conjunction with cytologic results. Healthy cats can have bacteria isolated from the lower airways, and detection of aerobic bacterial growth alone on culture is not indicative of bacterial infection. In the dog, true bacterial infection is associated with septic, suppurative inflammation and intracellular bacteria. A similar finding is likely the case in cats. The presence of *Simonsiella* bacteria or

squamous cells on cytology suggests oropharyngeal contamination of the sample and confuses the interpretation of culture results.

In the animal that presents with cyanosis and open mouth breathing, diagnostic tests should be kept to a minimum until the animal is stabilized. An oxygen-enriched environment should be provided. Bronchodilator therapy may aid in resolution of acute bronchoconstriction in cats with severe respiratory distress. Terbutaline, a beta-2 agonist, is an effective bronchodilator and has minimal cardiac side effects. It can be administered subcutaneously or intravenously (0.01 mg/kg) and relieves bronchoconstriction by functionally opposing smooth muscle contraction. Respiratory rate and effort should be monitored visually during the first 15-30 after treatment to determine the therapeutic response. If the cat fails to improve, a second dose of terbutaline can be administered. If the animal recovers sufficiently, further diagnostic testing can be performed. If the cat remains unstable and the most likely diagnosis is still bronchial disease, short acting steroids are recommended. Steroid therapy will reduce ingress of eosinophils into the airway, thus changing the cytologic preparation observed on tracheal wash or bronchoalveolar lavage, however they can be life saving.

Chronic management of feline bronchial disease relies on the judicious use of steroids to control inflammation. The duration and dose of corticosteroid therapy is adjusted according to the severity of respiratory distress in the patient and the rapidity of response to treatment. Initially, prednisolone is administered orally at 1 mg/kg BID for 5-14 days. The dosage is decreased to 0.5 mg/kg BID if the cat remains free of respiratory signs, and the dosage can be further tapered over time. Recurrent episodes of coughing or respiratory distress necessitate a return to the original dosage. Repeat diagnostic testing may also be indicated. Cats are relatively resistant to the side effects of corticosteroids, however, an attempt should be made to achieve the lowest dose of the drug that will control signs.

Use of inhaled steroids controls signs in some cats with chronic lower airway inflammatory disease. Current recommendations are to employ a pediatric spacer (www.aerokat.com or Optichamber) with facemask to optimize pulmonary penetration of drugs. Multiple steroid preparations are available for inhalation in metered dose inhalers. Fluticasone is recognized as the most potent and is generally instituted at a dosage of 1 puff of the 110 µg/actuation twice daily via the spacing chamber. The cat should inhale 8-10 breaths to achieve an adequate amount of drug. In cats with moderate to severe clinical manifestations of disease, oral steroids are recommended during the first two weeks of inhaled therapy for more rapid control of disease.

Two forms of bronchodilators are commonly employed in feline patients: beta agonists (terbutaline) and methylxanthine derivatives (theophylline). Terbutaline is indicated for use in emergency situations because it is a direct bronchodilator. It can be used parenterally at home in cats that suffer asthma

attacks and it can also be used chronically to improve the response to steroids. One disadvantage of terbutaline is the likelihood of decreased efficacy with long term use due to down regulation of beta receptors. Terbutaline is supplied in 2.5 and 5 mg tablets and as an injectable solution (IV, IM, SQ) of 1 mg/ml Alternately, albuterol inhalers are available for use with the pediatric spacer and facemask. Theophylline is a relatively weak bronchodilator but may gave other beneficial effects such as A number of theophylline or aminophylline products are currently available, however, a great deal of variation in bioavailability and pharmacokinetic parameters has been shown with these products. In the cat, 15 or 19 mg/kg of TheoChron tablets or capsules (Inwood Laboratories) can be given once daily in the evening. Sustained-release theophylline may act by preventing recurrence of acute attacks in people so it could be considered for use in cats as well. Theophylline might also improve response to steroids and aid in controlling inflammation.

Antibiotics are rarely indicated in cats with bronchial disease and should be prescribed based on culture/sensitivity and cytology results. Because clinical signs of airway infection in the cat could contribute to bronchial inflammation and airway hyper-responsiveness, ruling out infection is critical in any coughing cat.

In some cats with bronchial disease, inspissation of mucus or the production of viscid airway secretions can complicate therapy. In cases in which this is suspected, nebulization with sterile saline can be beneficial in helping to evaluate the airways of excessive secretions. Various types of ultrasonic nebulizers, which create aerosol particles < 4 microns in size) can be purchased from respiratory supply companies. The aerosol can be delivered into an aquarium or into a plastic cat carrier that is enclosed within a large plastic bag to help trap the aerosol cloud.

In specific forms of human asthma, good response to anti-leukotriene agents is reported, however studies have not supported a role for leukotrienes in feline bronchial disease. Anti-eosinophil, anti-IgE, and other anti-mediator drugs are under intense investigation in human medicine, but it is unknown whether any of these agents will be useful in the cat. Because feline airways are rich in sympathetic innervation, beta blockers should be avoided in cats with bronchial disease. Use of skin test or serum IgE analysis to detect allergens in cats with bronchial disease has not been widely adopted. It is unclear whether intradermal and skin responses are the same as those that occur within the airways. Cats that are refractory to therapy might be most desirable to test, however often they cannot be withdrawn from steroid therapy long enough to perform allergy tests.

Bronchiectasis

Bronchiectasis is described as irreversible dilatation of the bronchi with accumulation of suppurative airway secretions. The disorder is a poorly characterized condition associated with chronic obstructive and inflammatory

airway disease in cats. Foreign body pneumonia increases the potential for development of bronchiectasis due to a chronic inflammatory response combined with accumulation of infected airway secretions. Pneumonia early in life, ciliary dyskinesia, smoke inhalation, near drowning, aspiration pneumonia, or chronic bronchitis all predispose an animal to the development of bronchiectasis. In human medicine, it has been noted that pulmonary insults may precede the identification of bronchiectasis for as many as 13 years, and therefore, accurate and complete medical histories are beneficial in identifying potential underlying causes for airway dilatation.

Cats that have bronchiectasis as part of the syndrome of primary ciliary dyskinesia are typically young on presentation and have a history of serous to mucoid nasal secretions and chronic cough that may be initially responsive to antibiotics. Due to disruption of the normal function of microtubules, affected animals may have chronic otitis and infertility in conjunction with chronic rhinitis and pneumonia. Animals with acquired bronchiectasis are middle aged to older, and in the cat, it is unclear whether the presence of bronchiectasis contributes to disease or worsens prognosis.

Definitive diagnosis of bronchiectasis is difficult in veterinary medicine. Early radiographic lesions are subtle, and dilated, thickened airways be easily missed, particularly if pneumonia is absent. Computed tomography is used for the diagnosis in human medicine but has only recently been used more commonly in veterinary medicine to aid in the diagnosis of pulmonary disorders. Visualization of the airways through bronchoscopy allows documentation of bronchiectasis, however the operator must have knowledge of normal airway anatomy to recognize the abnormality. With bronchiectasis, the normal rounded bifurcations at bronchial branch points are replaced by dilated and more oval or irregular appearing airway openings. Airway space is increased as airways are pulled open because of the reduction in supporting parenchyma.

During bronchoscopy, lavage samples should be collected for cytology and cultures for aerobic and anaerobic bacteria, as well as *Mycoplasma*. Cytology is generally characterized by a high proportion of non-degenerate or degenerate neutrophils. In humans, aggressive *Pseudomonas* or *Hemophilus* infections are most commonly found. Given the purulence of secretions and the antibiotic responsiveness of many patients, deep-seated pulmonary infection seems probable. Long term, broad spectrum antibiotics are indicated for control of clinical signs, prevention of worsening airway pathology, and avoidance of systemic manifestations of chronic disease such as glomerulonephritis or septicemia. Drugs that penetrate the pulmonary tissue well should be employed, such as chloramphenicol, doxycycline, enrofloxacin, trimethoprim-sulfa, and clindamycin. Six weeks to six months of treatment may be required to resolve pulmonary inflammation. In severe cases, life-long antibiotics should be considered. Focal bronchiectasis may be amenable to surgical resection of affected lung lobes.

Young animals diagnosed with bronchiectasis should be evaluated for primary ciliary dyskinesia. Diagnosis requires documentation of functional and structural defects of cilia. Ciliary function is assessed through nuclear scintigraphy. A drop of technetium-labeled macro-aggregated albumin is deposited at the carina and movement is followed with a gamma camera. Animals with ciliary dyskinesia have no movement detected. Nasal or tracheal biopsies can be submitted for electron microscopy to identify the characteristic ultrastructural abnormalities seen in this congenital disorder, however EM is not widely available. A pathologist should be consulted prior to obtaining a biopsy to insure that an adequate sample is obtained and that a proper interpretation can be provided.

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MANAGEMENT OF RESPIRATORY DISTRESS

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The respiratory pattern of the animal provides important clues for localization of disease. Diseases of the pleural and parenchyma restrict lung movement, resulting in a rapid and shallow breathing pattern. Obstructive disorders such as chronic bronchitis or feline bronchial disease cause slow, deep breathing, typically with prolongation of the expiratory phase. Abnormal sounds during breathing can also help localize disease. Typically, loud sounds heard without a stethoscope reflect upper airway obstructive diseases: nasal cavity, nasopharyngeal, oropharyngeal, or laryngeal disease.

Respiratory auscultation should include the larynx, trachea, and all lung fields. Adventitious lung sounds can be augmented by inducing a cough, causing brief breath holding, or by exercising the patient. Percussion is most useful in the presence of pleural effusion or air trapping in the periphery, and it can be difficult to interpret in the cat due to the small size of the thoracic cage. Fluid or air in the chest cavity will lead to dull or hyper-resonant sounds respectively, on percussion. Cardiac auscultation, fundic examination, abdominal palpation, and an assessment of the general health of the patient will aid in the final diagnosis.

Successful management of an animal in respiratory distress depends upon accurate anatomic localization of disease and efficient diagnostic planning. Assessment of the pattern of breathing, careful examination and auscultation of the respiratory tract, and swift determination of the history of the complaint will assist in determining the site responsible for generation of respiratory distress.

Upper Airway Disorders: Respiratory difficulty associated with upper airway obstruction results from disease in the nasal cavity, pharynx, or larynx. In general, respiratory difficulty is noted on inspiration in affected animals. Associated signs include sneezing and nasal discharge in the case of nasal diseases, and voice change, decreased vocalization, or dysphagia in association with laryngeal diseases.

Cats with nasal disease have a long-term history of stertorous breathing and sneezing. In some instances, total obstruction of the nasal cavity may develop due to impaction of secretions in the nasopharynx or development of a secondary lesion. In that event, open mouth breathing and respiratory distress occurs. Usually localizing signs of nasal disease are readily apparent, however cats can be adept at hiding the progression of signs. Nasopharyngeal obstruction in cats can result from mass lesions associated with polyps, neoplasia, or fungal infection, or with formation of a stenotic scar across the nasopharynx.

Animals with nasal disease causing obstruction generally have decreased nasal airflow on physical examination. Animals can breathe well through the mouth but exhibit distress when one nostril is occluded or when the mouth is held closed. Whenever possible, the caudal aspect of the soft palate should be palpated for abnormalities. Generally, the soft palate is easily depressed into the roof of the nasopharynx with digital palpation. A nasopharyngeal mass can be felt as a space-occupying lesion dorsal to the soft palate.

Full evaluation of the patient with nasal obstruction starts with imaging of the region under anesthesia with skull radiographs or computed tomography. Visual inspection of the region via caudal and rostral rhinoscopy is then performed. Caudal rhinoscopy is most easily achieved with a flexible endoscope, however in some animals, rostral retraction of the soft palate and illumination of a dental mirror behind the soft palate allows adequate examination.

Animals with laryngeal disease present with variable degrees of respiratory distress, exercise intolerance, tachypnea, and cough. Careful questioning of the owner may reveal a voice change or a reduction in vocalization in the recent history. The etiology may be laryngeal paralysis or a mass lesion in the larynx. Bilateral laryngeal paralysis appears to be more common than unilateral in cats. Diagnosis is based on visualization of decreased or absent laryngeal abduction on inspiration in an animal under a light plane of anesthesia. Prior to anesthetizing the patient, a radiograph or ultrasound of the larynx should be considered. Radiographs may reveal a soft tissue density in the larynx suggestive of a mass lesion. An accomplished ultrasonographer can identify either a failure of laryngeal cartilages to abduct on inspiration or can identify a mass lesion.

Laryngoscopy is best performed under a light plane of anesthesia while an assistant identifies inspiratory efforts to the examiner during the procedure. Visualization of the larynx will also identify mass lesions (inflammatory or neoplastic) on laryngeal cartilages, and biopsies should be obtained in all cases. A primary, granulomatous, lymphocytic inflammation of the larynx has been reported in cats that can appear very similar to laryngeal neoplasia. Intensive medical, sometimes in combination with surgical debulking can restore a good quality of life.

Airway Disorders: Airway diseases resulting in respiratory distress include bronchial disease in the cat, tracheal injury, mass lesions, and tracheobronchial foreign bodies. Traumatic injuries to the neck from a dog fight or automobile accident can lead to an acute disruption of the trachea with a rapid onset of respiratory distress. Subcutaneous emphysema is often present. A crushing injury to the neck region can lead to late onset of tracheal disease due to delayed necrosis of the tracheal rings and soft tissues. Late onset injuries may be more difficult to diagnose as external signs of injury are often lacking. A careful history and gentle palpation of the neck region will assist in the diagnosis. Iatrogenic tracheal rupture associated with endotracheal intubation can occur within hours

after the insult or may be delayed for several weeks. This condition is seen more often after dental procedures in the cat than any other therapeutic procedures. This is most likely due to the changes in positioning required during a dental procedure. Fortunately, most of these cases respond to conservative management, with emphysema resolving within 1 to 6 weeks. When surgery is required to alleviate clinical signs, the tracheal lesion has been found most often within the thoracic inlet or thoracic trachea. It is important to realize that a small volume of air (generally 1-3 mls) is required to inflate the cuff of the standard endotracheal tube used in the cat. After intubating a cat for anesthesia, the anesthetist should use a minimal volume to inflate the cuff during expansion of the lungs.

Cough is a common complaint in animals with foreign bodies or mass lesions in the large, conducting airways, and the cough is often severe and paroxysmal. Tracheal sensitivity is severe. Cats will often show an obstructive breathing pattern characterized by long, inspiration with increased effort when a large airway is obstructed. An intraluminal mass can be seen disrupting the column of air within the trachea on radiographs, however a mass lesion in smaller regions can be difficult to discern. Bronchoscopy may allow removal of a foreign body, and biopsy or debulking of a mass lesion in the airways, however some cases require resection and anastomosis for definitive resolution of disease. Tracheotomy may be required in animals with high cervical lesions.

Cats with airway obstruction due to feline bronchial disease may also have a history of cough, however many cats present with acute bronchoconstriction as a complaint. These cats may have increased adventitious lung sounds and wheezes apparent on expiration.

Parenchymal Diseases: Disorders of the pulmonary parenchyma associated with respiratory distress include pneumonia, pulmonary edema, and interstitial lung disease. Pulmonary edema is often associated with an acute onset of clinical signs and may follow a history of lethargy and exercise intolerance. Cats with pulmonary fibrosis typically display exercise intolerance, and tachypnea, coughing, or difficulty breathing can be noted later during the course of disease. Animals with pneumonia often have a vague history of illness characterized by anorexia, malaise, and weight loss.

In a cat presenting for difficulty breathing and tachypnea, it can be difficult to distinguish heart failure from respiratory disease. Cats with bronchial disease typically have a history of cough, while cough is generally absent in feline heart disease. The presence of a gallop rhythm or arrhythmia places the diagnosis of cardiac disease higher on the differential list, however, up to 30% of cats with hypertrophic cardiomyopathy lack a cardiac murmur, and mitral murmurs can be found in a large number of cats lacking heart failure. Heart rate is not as helpful in differentiating cardiac from respiratory disease in the cat as it is in the dog, since cats do not commonly develop a respiratory arrhythmia in association with lung

disease as dogs do. Crackles on inspiration are typically ausculted over the thorax in animals with pulmonary fibrosis and vary in severity from mild to severe, although inspiratory crackles can also be heard with pneumonia, chronic bronchitis, or pulmonary edema.

In the animal with severe respiratory distress, care should be taken to reduce stress and to do no harm. Placing the pet in a quiet, oxygen-enriched environment can stabilize its condition enough to allow some diagnostic tests to be performed. Thoracic +/- neck radiographs are performed when the animal's breathing has improved, and oxygen should be supplied to these animals during the procedure. Radiographic patterns are critical in constructing a list of differential diagnoses for the respiratory complaint, however diffuse alveolar infiltrates in the cat can represent pulmonary edema, bronchial disease, interstitial pneumonia, or neoplasia! Additional test are required to determine the underlying etiology.

Further diagnostics are performed depending on the most likely disease present. Cardiac disease is supported by results of an electrocardiogram and echocardiography. Evidence of chamber enlargement on an ECG (R-wave amplitude > 0.9 mV in lead II) or a sustained arrhythmia might be considered suspicious of cardiac disease. Feline heart diseases do not lead to characteristic radiographic changes in the cardiac silhouette, and echocardiography is often required to provide a definitive diagnosis of the type cardiomyopathy present. When pneumonia is most likely, airway samples should be collected for aerobic/anaerobic bacterial and *Mycoplasma* culture and for cytologic examination. Interstitial lung diseases remain the most difficult to diagnose since lung biopsy is required for characterization.

Pleural Abnormalities: Cats with pleural disease can present with acute signs of respiratory distress despite long-standing disease. The primary clinical sign associated with pleural disease is shortness of breath, with a rapid, shallow breathing pattern. Elbows are abducted and the neck is extended in order to improve the movement of air into the alveoli. Usually, the degree of respiratory distress is associated with the rapidity of fluid or air accumulation rather than with the specific volume present.

Auscultation and percussion of the chest aids in the diagnosis of a pleural disorder, although the utility of percussion in a cat is limited because of the small size of the thoracic cavity. With pleural effusion, lung sounds are ausculted in the dorsal fields only and muffled sounds are heard ventrally; heart sounds are also muffled. Percussion of a chest cavity filled with fluid reveals dull sounds in affected areas. Pneumothorax leads to an absence of lung sounds dorsally due to compression by air. Lung sounds are present in the ventral fields only. In an animal with pneumothorax or air trapping, percussion reveals increased resonance.

Animals with a pleural disorder often present with acute respiratory embarrassment. An immediate decision must be made whether to proceed with diagnostic radiographs or to perform thoracocentesis, and this decision is usually based on physical exam findings. When taking radiographs, it is important to place the animal in sternal recumbency rather than performing a ventrodorsal view. Positioning for the VD view places excessive stress on the respiratory system and increases the likelihood of decompensation. Both left and right lateral views are beneficial, especially when unilateral effusion is present.

Thoracic ultrasound can often be helpful in localizing fluid for thoracocentesis and for determining the etiology of pleural effusion. Ultrasound is particularly helpful in identifying mass lesions due to neoplasia, lung lobe torsion, abscessation, or herniation. Fine needle aspiration of mass lesions or loculated fluid can be critical in determining a primary etiology for pleural effusion.

Thoracocentesis is performed as a diagnostic and therapeutic technique, before or after radiographic confirmation of a pleural disorder. The region of the 7^{th} – 8^{th} intercostal space is clipped and scrubbed in the ventral portion of the chest for fluid, or in the dorsal 1/3 of the chest for air. For a diagnostic tap, a 19-21 gauge butterfly needle with extension tubing works well. When a large pleural effusion is present, a fenestrated 20-22 gauge catheter with extension set can be used. With the bevel pointed downwards, the skin is tented to allow easy penetration, and then the needle is inserted into the pleural space off the cranial border of the rib. The needle should be oriented ventrally at a 45 degree angle after the pleural space is entered, and if a catheter is used, the needle is held still while the catheter is fed over the needle into the chest cavity. A 3-way stopcock and syringe should be immediately accessible for attachment to the extension set. Specimen collection should be anticipated: EDTA and clot tubes and a culturette swab should be available, along with a bowl to collect large volumes of fluid.

In-house pleural fluid analysis should always include a PCV, cell count, protein or specific gravity, and cytology. Smears may also be prepared for possible Gram staining. Additional tests that are often done include bacterial culture and susceptibility testing (aerobic and anaerobic cultures), cholesterol:triglyceride ratio for the diagnosis of chylothorax, protein electrophoresis, or immunocytochemical staining for FIP.

Appropriate diagnostic tests for systemic disease can be chosen after the character of the pleural fluid is determined. For example, a transudative fluid (protein < 1.0 g/dL) is most likely related to hypoproteinemia. A complete database including CBC, chemistry profile, and urinalysis should be obtained to help determine whether low albumin is related to decreased production (due to liver disease) or increased loss (due to gastrointestinal or renal disease). Hypoglobinemia in conjunction with hypoalbuminemia would support gastrointestinal loss and would indicate the need for intestinal biopsies. Other

tests that might be required include bile acids to characterize liver disease or a urine protein-to-creatinine ratio to support significant renal loss of protein.

If chylothorax is diagnosed by detecting high triglyceride levels in the pleural fluid compared to serum, additional tests should be performed to seek an etiology. Although often idiopathic, diseases associated with increased right heart pressures such as cardiomyopathy, pericardial disease, and heartworm disease, have been reported as potential causes. Mediastinal masses such as lymphosarcoma have been associated with chylothorax, and an association between lung lobe torsion and chylothorax has been recognized. Traumatic rupture of the thoracic duct is a relatively rare cause of chylothorax.

Follow-up chest radiographs after removal of pleural effusion can be helpful in determining a primary etiology such as lung lobe torsion or neoplasia. Chronic diaphragmatic hernia can be more difficult to document, and even injection of contrast material into the thoracic or abdominal cavity may fail to elucidate a rent in the diaphragm.

CATalyst for Change- for the Future of Cats

Sunday, July 27, 2008

Jane Brunt, DVM

Recent reports and the current economy indicate a downturn in feline veterinary health care.

CATalyst is a national initiative to champion the cat in light of some significant statistics released by the American Veterinary Medical Association that show an increase in the cat population that parallels a decline in veterinary visits. In the AVMA's *2007 U.S. Pet Ownership & Demographics Sourcebook*, it was reported that 36.3% of cat-owning households received no veterinary care in 2006, compared to 17.3% of dog-owning households. Even though there are an estimated 81 million owned cats in the U.S. compared to 72 million dogs, this means that cats are twice as likely to *not* see a veterinarian.

Consequently, the American Association of Feline Practitioners held the CATalyst Summit in February of 2008, where key representatives from more than 30 leading organizations and companies gathered to discuss how to **improve health care for felines, increase responsible pet ownership, enhance the stature of cats, and enrich lives.** At this two-day event, an action plan was developed to respond to these and other alarming statistics that show the current crisis in feline healthcare.

The action plan includes the following five elements:

- Continue to Collaborate Across all Channels (organized vet medicine, shelter/rescue/humane organizations, foundations, industry, and the media)
- Develop Feline Life-Stage Guidelines (for veterinarians and pet owners)
- Create Cat-Friendly Veterinary Practices
- Brand the Cat by Promoting a Positive Image
- Produce a Consumer Awareness Campaign

As an immediate outcome of the Summit, the AAFP and the American Animal Hospital Association announced their plan to partner on developing feline life-stage wellness guidelines for veterinary professionals. Winn Feline Foundation will coordinate the writing of a consumer version of the guidelines underwritten by Hill's Pet Nutrition, Inc. Initial sponsorship of the CATalyst Summit was provided by Pfizer Animal Health as an extension of the ongoing KNOW Heartworms Campaign in which Dr. Jim Richards represented the AAFP prior to his death.

Subsequent to the Summit, a steering committee met in March 2008 at the annual meeting of the American Animal Hospital Association to determine the best structure for the organization moving forward. In May, it was voted that a not for profit corporation, the CATalyst Council, would be formed in the state of Missouri, with the headquarters in Kansas City, the hub of the Animal Health Corridor.

CATalyst Council, Inc. has held two meetings to date. Currently, the eleven member Board of Directors is comprised of one representative each from AAFP, AVMA, AAHA and SAWA, the Society of Animal Welfare Associations, four representatives from industry, and three representatives at large.

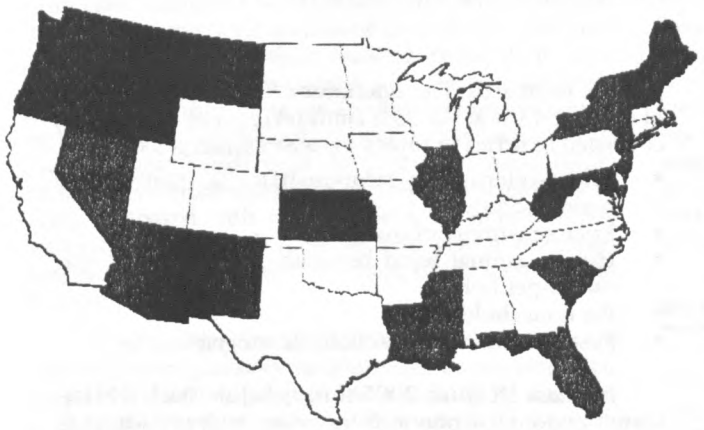
Continued communication and collaboration between all stakeholders in feline health is essential in achieving the goals of CATalyst. Additional anticipated activities include a contest for Feline- Friendly Practice Features, and large-scale campaign efforts as networking, resource development, and relentless repetition of the message continue.

Everyone and anyone who cares for cats is obligated to be agents for change. Each person's effort in supporting CATalyst by lecturing, participating in educational programs, and facilitating fundraising opportunities will help cats, ultimately all over the world. Stakeholders-be they the Cornell Feline Health Center, the American Association of Feline Practitioners or other organized veterinary medical associations, academia, welfare, shelter and humane organizations, foundations, industry and other commercial entities, the media- need only to keep in the forefront that *"it's all about the cat."*

catalyst

catalystsummit.org

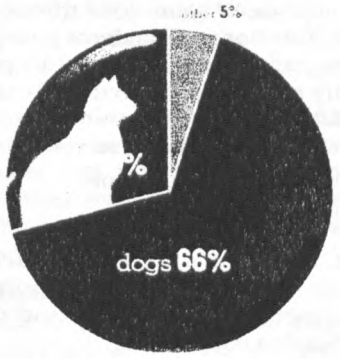
Cat Ownership Facts



Growth in Cat Ownership for 2006

top 10 states in 2006

bottom 10 states in 2006



Total Veterinary Expenditures

- The current domestic cat population in the U.S. was 81.7 million at the end of 2006, almost 10 million more than dogs.
- The number of owned cats has increased 38% since 1996.
- Cat-owning households represent 32.4% of all U.S. households.
- Cat-owning households had an average number of 2.2 cats in 2006, compared to 1.7 dogs per dog-owning households.
- Nearly half (49.2%) of all cat owners consider their cat to be a family member; 49.4% consider cats as pets or companions.
- In 2006, 36% of cats did not visit the veterinarian, compared to 17% of dogs.
- Overall veterinary visits for cats have decreased almost 11% since 2001. (Cats visited the veterinarian 63.3 million times in 2006).

From The American Veterinary Medical Association's 2007 U.S. Pet Ownership & Demographics Sourcebook

FELINE PRACTITIONERS

Pfizer Animal Health

Special Report

Impact of the owner-pet and client-veterinarian bond on the care that pets receive

Todd W. Lue, MBA, PRC; Debbie P. Pantenburg, BS; Phillip M. Crawford, MS

In 2006, a task force representing a dozen companion-animal health industry suppliers, medical providers, and associations gathered to discuss how companion-animal practices would maintain growth amidst ongoing struggles with static service growth and poor compliance results. The group questioned the level of consumer willingness to undertake veterinarian care for sick or injured pets as well as to maintain wellness programs involving ongoing examinations, vaccinations, preventive dental care, and other products and services.

Until now, virtually no national comprehensive research had been conducted on the perceptions and attitudes of consumers toward veterinary care and their willingness to purchase related products and services. The task force commissioned BNResearch of Portland, Ore, to conduct a national study of pet owners to research their perceptions and attitudes. The Industry Task Force includes the AVMA; Banfield, The Pet Hospital; Bayer HealthCare LLC; Fort Dodge Animal Health; Hill's Pet Nutrition Inc; IDEXX Laboratories Inc; Mars Symbioscience; Merial Ltd; National Commission on Veterinary Economic Issues; Novartis Animal Health; Pfizer Animal Health; and VCA Animal Hospitals.

The primary objective of the study reported here was to uncover detailed information about the relationships between owners and their pets and the impact those relationships have on the veterinary care pets receive. Also studied were perceptions and attitudes pet owners have toward veterinarians and the price awareness and sensitivity of owners toward purchasing veterinary products and services.

Methods

Research phases—BNResearch designed and conducted this study in 4 phases. Phase I (May 2006) consisted of 135 in-depth phone interviews with pet owners and was used to help design an effective questionnaire for the next 2 phases of the study. In phase II (June 2006), phone surveys were completed by a randomly selected sample of 600 dog and cat owners across the United States to provide a representative view of the household composition of pets and up-to-date demographic estimates. The maximum SE for a sample size of 600 is ± 4.0% at the 95% confidence level. The survey consisted of series of topics for assessment as follows:

- Client-veterinarian relationship (ie, client-veterinarian bond).
- Price sensitivity of owner.
- Human-animal bond between owner and pet (ie, owner-pet bond).
- Pet household profile.
- Respondent and household demographics.

In phase III (June 2006 through July 2006), BNResearch conducted phone interviews with an additional 1,400 pet owners, asking the same questions as in phase II. For this phase, targeted households with dogs and cats were included to provide sufficient numbers of respondents to permit analysis of a variety of subpopulations determined by age, income, number and type of pets, and so on. Data from this phase were also combined with data from phase II and weighted to provide a total study sample size of 2,000. The maximum SE for the total sample is ± 2.2% at the 95% confidence level.

In phase IV (June 2006 through July 2006), 755 of the 2,000 phone respondents completed an online survey regarding their likelihood to purchase various veterinary products and services. By use of conjoint analysis, data from this phase were used to develop demand curves for the following services and products:

- Heartworm medication.
- Flea-tick prevention.
- Preventive dental care.
- Combinations of common vaccinations.
- Routine physical examinations, including various combinations of services and diagnostic tests.
- Spaying or neutering.

Statistical analysis—Various statistical methods were used to analyze the survey results. For testing for differences between means and between percentages, *t* tests and Z tests were used, respectively. For examining relationships between variables measured with scales or numeric values, multiple regression analyses were used. Relationships between variables measured with nominal values as the independent variable (eg, male or female; dog or cat) were examined by use of an ANOVA. Relationships between variables measured with nominal values as both the independent and dependent variable (eg, male or fe-

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male; dog or cat) were examined by use of the χ^2 test and proportional reduction in error (eg, τ and λ). For finding underlying common dimensions in groups of variables measured with scales or numeric values and constructing the indices, factor analysis was used. For all comparisons, a value of $P < 0.05$ was considered significant.

Major Study Findings

Strong owner-pet bond relates to a higher level of veterinary care—Owners who exhibit strong bonds with their pets seek higher levels of veterinary care, compared with owners who exhibit weaker bonds. A strong bond is defined by specific behaviors of owners related to their feelings about their pets, the amount of time they spend with the pet, activities they do with their pets, and other factors explained in this report. Study findings reveal that owners with the strongest bonds with their pets are more likely to follow veterinarian recommendations regardless of cost, compared with other owners. Owners who are strongly bonded with their pet also visit a veterinarian more frequently and are more likely to seek preventive care.

Opportunities for growth in veterinary care of cats—Owners generally have stronger bonds with their dogs than their cats and are likely to be more attached to dogs and more attentive to their needs. The greater strength of the owner-pet bond and attachment with dogs is indicated by dog owners seeking higher levels of veterinary care than cat owners. Overall, cat owners have a higher level of education than dog owners and therefore are excellent prospects for understanding the need for increased veterinary care. Also, although cats are seen by veterinarians significantly less often than dogs, three fourths of cat owners state they have considered obtaining regular physical examinations. This offers a potential opportunity for veterinarians to do a better job of communicating to cat owners the need for more frequent veterinary visits, potentially increasing the care cats receive.

Study findings also reveal that in households with dogs and cats (≥ 1 of each), cats are seen by veterinarians significantly less often than dogs. While seeing a family dog, veterinary teams should make it part of standard procedures to inquire about other pets in the household and educate owners about their specific needs.

Level of pet care received linked to communication skills—Communication by the veterinarian plays a significant role in the strength of the bond between a veterinarian and pet owner. The strength of this bond, or relationship, has a direct impact on the loyalty of a pet owner to a veterinarian and the care pets ultimately receive. Top indicators of a strong client-veterinarian bond are detailed in this report and include communication skills of veterinarians, interaction with pets, and the perception of owners that veterinarians only sell them things their pets need.

How well veterinarians explain the reasons for their recommendations drives the clients' perceptions of the value and quality of care. Survey results reveal the strong, positive impact that communication and pet interaction have toward clients following the recommendations of a veterinarian. In fact, a main reason cited by pet owners for not following recommendations was that they felt the recommended treatment was not necessary. Many could not cite any reason for not following the treatment plan.

Veterinary care decisions made on factors other than price—Owners who exhibit behaviors indicative of a strong owner-pet bond are more likely to seek high levels of care, are less sensitive to the price of care, and are more willing to follow the recommendations of a veterinarian, compared with other owners. Although most pet owners are conscious of the cost of veterinary care, the vast extent of owners indicate it does not prevent them from undertaking recommended treatment. A small segment of price-sensitive pet owners exists whose decisions are impacted by price, and these owners sometimes have foregone recommended care. Demand for products and services included in this study reveals a consistent pattern of the indifference of many owners to the price for needed pet-care products and services.

Pet-owning Households

General pet owner demographics—In this report, survey respondents are also referred to as "owners." Approximately two thirds (68%) of respondents were female and one third (32%) were male. Median age was 43.4 years old. Most respondents had some education beyond high school (college or advanced degree [38%] or vocational training or some college [28%]). Compared with the overall US population, pet-owning households were more likely to have children under the age of 18. Pet owners were slightly more affluent than the overall US population, earning a median household income of $55,100. The typical pet-owning household included approximately 3 people (2.9).

Approximately 6 of 10 (59%) US pet-owning households had > 1 pet. Households with dogs, cats, or both averaged 2.48 pets (1.346 dogs and 1.134 cats/household). Approximately three quarters (77%) of all households with a dog, cat, or both had ≥ 1 dog, whereas just greater than half (53%) had ≥ 1 cat. Dog owners were more likely than cat owners (86% vs 77%, respectively) to live in a house, whereas cat owners were more likely than dog owners (19% vs 12%, respectively) to live in a multifamily dwelling. Households with dogs had higher median incomes than households with cats ($57,000 vs $52,100, respectively). The typical cat was approximately half a year older than the typical dog (5.9 years old vs 5.5 years old, respectively).

For 13% of respondents, their current pet was their first, meaning approximately 1 in 8 owners had little or no experience caring for a dog or cat. Results of this study indicated that males were more likely to be first-time owners. Most cat owners obtained their cat from a "free source," taking them in as strays or from family and friends, whereas dog owners were more likely to purchase their dogs from breeders and adoption agencies (Table 1). Study findings reveal that 79% of cat owners paid nothing for their cats, compared with 43%

of dog owners. Of those who did pay for their pets, they spent $105 and $320 on average for their cat and dog, respectively.

Seven in 10 respondents said they shared responsibility for the care of their pet with someone else in their household; of all respondents, 51% shared the responsibility equally with someone whereas 19% were the primary caregiver. Shared responsibility was more common for dogs, whereas sole responsibility was more common for cats. This finding points to a common issue that could adversely impact pet care when only 1 of the decision makers is present at a veterinary visit. To potentially increase positive outcomes, veterinarians should ensure that all parties responsible for the care of the pet, including those not present at the veterinary visit, clearly understand the reasons and instructions for the recommended treatment plan.

Dog and cat owner profiles—In this study, differences between dog and cat owners in their perceptions and attitudes regarding care for their pets were examined. The results highlight a major gap in veterinary care received by cats. Compared with dog owners, cat owners were more likely to have the following characteristics:

- Female.
- Live alone in multifamily unit.
- Likely to take in a stray.
- Some college education.
- Took cats to veterinarian ≤ 1 time/y.

Compared with cat owners, dog owners were more likely to have the following characteristics:

- Male.
- Shared responsibility for care of dogs.
- Paid for dogs.
- Less formal education.
- Took dog to veterinarian ≥ 2 times/y.

Table 1—Pet owners who acquired dogs or cats from various sources. Values based on 2,000 respondents.

	Dog		Cat	
Sources	**%**	**± SE (%)**	**%**	**± SE (%)**
Family or friend	33	2.1	35	2.1
Breeder	27*	1.9	6	1.0
Adoption	20	1.8	19	1.7
Stray	7*	1.1	25	1.9

*Significant ($P < 0.05$) difference between dogs and cats.
SE = Standard error of sample size at the 95% confidence level.

Compared with pet owners in general, owners with both dogs and cats (≥ 1 of each) were more likely to have the following characteristics:

- Female.
- Household with children.
- Some college education.
- Shared responsibility for care of pets.

Compared with cat owners, dog owners took their dogs to veterinarians more frequently and were more apt to follow recommendations. Cat owners may be less willing to pay for the care recommended unless they clearly understand the need and benefit.

Owners took their dogs to veterinarians > 2 times as often as cats, averaging 2.3 times/y, compared with 1.1 times/y for cats. Significantly more cats (72%) than dogs (42%) were seen by a veterinarian ≤ 1 time/y. Dog owners were significantly more likely than cat owners to seek vaccinations (73% vs 55%, respectively), regular physical examinations (67% vs 49%, respectively), and preventive dental care (22% vs 9%, respectively).

Dogs from multi-pet households also were seen by veterinarians significantly more often than were cats in the same household. A third of cats from these households (33%) did not visit a veterinarian annually, compared with only 13% of dogs. Because 30% of households with pets had ≥ 1 dog and cat, this represents an important opportunity to provide increased care to a sizable population of cats.

The study results suggested several potential strategies that might improve compliance with recommendations for veterinary care. When seeing a family dog, support staff should be encouraged also to schedule an appointment for any cats in the household. Success will be dependent on veterinary teams consistently interviewing owners about all pets in the family, documenting the household composition of pets, and making notes for veterinarians for further discussion with owners.

Owner-pet bond

Indicators—The strength of the bond between owners and their pets has a significant influence on the care pets receive. BNResearch used a series of questions to identify the indicators most closely associated with a strong or weak owner-pet bond. Respondents were asked to rate their level of agreement with a series of statements. Other questions solicited open-ended responses regarding pet-related activities. Top indicators of the owner-pet bond were identified (Table 2).

Table 2—Indicators of the owner-pet bond on the basis of statements that owners strongly agreed with.

	All owners		Dog owners		Cat owners	
Strongly agree	**%**	**n**	**%**	**n**	**%**	**n**
Would spend any amount necessary to keep pet healthy	48	1,951	52*	1,190	42	761
Considers pet a child	40	1,985	43*	1,205	36	781
Often buys gifts for pet	42	1,990	48*	1,209	34	780
Misses pet when owner is away from home	54	1,949	58*	1,185	47	720

*Significantly ($P > 0.05$) higher value for dog owners, compared with cat owners.
n = Number of respondents on which percentages for each reason are based.

Time spent with pet—The strength of the owner-pet bond relates, in part, to the amount of time a pet spends indoors and in which rooms the pet is allowed. Owners with the strongest pet bonds kept their pets indoors, allowed them in all rooms of the house, and/or allowed them to sleep in the bedroom.

Many pets (55%) spent most of their time indoors. Most (70%) were allowed in all rooms. A little over half (52%) slept in the bedroom. This was more prominent among dogs (56%) than cats (46%). Not surprisingly, results indicated that nearly a third of cats (31%) slept "wherever they wanted." Owners who spend more time with their pet than the average have stronger pet bonds, are more apt to have a dog, be female, or live in a household without children.

Dog owners spent a mean of 45.3 h/wk with their dogs, compared with cat owners, who spent a mean of only 32 h/wk. Beyond the mean values, it is important to mention that 40% of dog owners spent > 30 h/wk with their dogs, whereas the equivalent proportion of cat owners spent < 10 h/wk with their cats. Not only does this relate to the strength of the owner-pet bond, but this difference could result in delayed detection of health problems in cats, especially because cats often mask illnesses and injuries.

Differences in pet bond between owners of dogs and cats—Owners in households with ≥ 1 dog and cat were more attached to their dogs than their cats by a 3 to 1 margin (57% vs 19%, respectively). In general, dogs were seen as more affectionate and more fun to be around. Children were more attached to their dogs than their cats. Dogs were seen more as part of the family and a better fit (**Table 3**). Males and owners in 1-person households were significantly more likely than females and owners in households with 2 or more people to prefer dogs over cats (66% vs 52% and 75% vs 52%, respectively).The top 2 reasons owners mentioned for being more attached to their dog or cat related to the interaction the pet has with the people in the household and the length of time the pet has been with the owner (**Table 4**).

Greater attachment of owners to dogs may account for a third (33%) of respondents agreeing that it is more important to take a dog versus a cat to a veterinarian for routine wellness examination. This agreement was more common among males than females (47% vs 27%, respectively) and for those with children versus no children (37% vs 26%, respectively).

Moreover, the deeper attachment owners have with dogs likely contributed to dogs being seen by veterinarians > 2 times as often as cats. The fact that > 4 times as many pet owners felt it is easier to take care of a cat, compared with a dog (54% vs 12%, respectively), may have also contributed to the belief that dogs need to be seen by veterinarians more frequently. Cats get shortchanged medically for several reasons. Owners thought dogs were in need of more routine examinations because they are outside more (36%) and are more problematic (31%) than cats. Owners were also under the misperception that cats do not get sick (11%) and that cats can take care of themselves (7%).

Owners who fed pets specialty foods—Approximately half of dog owners (55%) and cat owners (45%) fed their pets specialty or premium foods. This includes prescription, life stage, and premium diets. There was a correlation between owners with strong owner-pet bonds and those that fed specialty foods. Dogs (34%) were significantly more likely than cats (24%) to eat premium foods.

Impact of owner-pet bond on veterinary care—Owners who exhibited behaviors indicative of a strong owner-pet bond were more likely to seek higher levels of veterinary care for their pets, were less sensitive to the price of veterinary care, and were more willing to follow the recommendations of veterinarians, compared with other owners. Owners with strong owner-pet bonds took their pets to veterinarians 40% more often than owners with weak owner-pet bonds (mean of 2.1 visits/y vs 1.5 visits/y, respectively).

Contrary to the perception of many veterinarians regarding the sensitivity to cost by pet owners, 76% said

Table 4—Reasons given by owners for greater attachment to dogs versus cats within households with both animals.

Reasons	Greater attachment with dog (%)	Greater attachment with cat (%)
Interacts more with people	30	24
Had for the longest time	22	31
Like personality	13	9
More of a companion	14	6
"My pet"*	4	14
I am a dog person	16	NA
I am a cat person	NA	10
Total No. of respondents	**287**	**97**

*Respondent was more attached to the dog or cat because it belonged to them.
NA = Not applicable.

Table 3—Pet owners with attachments to dogs versus cats on the basis of stated reasons.

	Dog			Cat		
Reasons	**n**	**%**	**± SE (%)**	**n**	**%**	**± SE (%)**
More part of family	242	30	5.8	237	3	2.2
Better fit with family	226	26	5.7	242	8	3.4
Other household adult more attached	207	39	6.6	221	16	4.8
Children more attached	150	42	7.9	146	12	5.3
Spend more time with	261	50	6.1	237	10	3.8
Enjoy time with	249	34	5.9	235	7	3.3
More affectionate	245	43	6.2	238	9	3.6
More fun to be with	219	42	6.5	272	6	2.8

See Tables 1 and 2 for key.

they would "spend any amount necessary to keep their pets healthy." The proportion of dog owners (80%) who agreed with this statement was significantly greater than the proportion of cat owners (69%). Having no children resulted in more positive responses than having children (81% vs 71%, respectively). Interestingly, the level of agreement to spend any amount necessary decreased as education and income increased.

About half of pet owners (52%) said they "always do exactly what their veterinarian recommends even if the treatment is inconvenient and time consuming." Surprisingly, a significant difference in this regard did not exist between dog and cat owners. Pet owners with children at home were less apt to indicate this level of compliance. In addition, the propensity to follow recommendations decreased as the education level of owners increased. Again, the demographics of the owners most likely to follow recommendations of a veterinarian corresponded with the profiles of those with a strong owner-pet bond. Most owners with strong pet bonds (74% of cat owners and 79% of dog owners) were willing to do what their veterinarian recommends, regardless of cost.

Characteristics of owners with a strong or weak owner-pet bond—The study was used to look at indicators, characteristics, and profiles of owners with the strongest and weakest owner-pet bonds. Although the profiles are important to help better serve clients and pets, it is not intended to stereotype owners. There were owners in every demographic group who exhibited strong bonds with their pets.

Dog owners with stronger bonds exhibited the following characteristics:

- Female.
- Paid for dog.
- Lower household income (≤ $40,000).
- Solely responsible for care of dog.
- Less education (high school education or less).
- No children under the age of 18 in the household.

Cat owners with stronger bonds exhibited the following characteristics:

- Female.
- Lower household income (≤ $40,000).
- Live in an apartment or townhouse.
- College degree.

Dog owners with weaker bonds exhibited the following characteristics:

- Male.
- Acquired dog from family or friends (paid little or nothing).
- Higher annual household income (≥ $60,000).
- More educated (some college education or higher).
- Live in a single-family house.
- Live in a household with ≥ 3 people.

Cat owners with weaker bonds exhibited the following characteristics:

- Male.
- Paid little (< $100) or nothing for cat.
- Higher annual household income (≥ $80,000).
- Children under the age of 18 in the household.
- Live in a single-family house.
- Live in a household with ≥ 3 people.

Attitudes Regarding Veterinary Care

Veterinary visits—When owners were asked the main purpose for their most recent veterinary visit, vaccination was the leading reason given for dogs (42%) and cats (39%). Routine examinations were a distant second reason and accounted for 21% of visits. Dogs were brought to a veterinarian for injury-related reasons significantly more often than cats, whereas the reverse is true for spaying or neutering (Table 5).

Vaccination was the top item cited by owners when asked whether any additional products and services were received during veterinary visits. Even though an examination was most likely performed when pets were vaccinated, spayed or neutered, or treated for sickness or injury, < 1 in 10 respondents mentioned their pet receiving an examination (Table 6). This oversight may be the result of pet owners not viewing the examination as a separate service or the veterinarian not making them aware that an examination was performed. The finding represents an opportunity for veterinary teams to fully explain all services provided and to emphasize the value of physical examinations.

Loyalty of pet owner to veterinarian—Typical pet owners have used their current veterinarian for 5.6 years. Almost 3 in 10 (28%) have been with their veterinarian for ≥ 10 years. Nearly two thirds (63%) of respondents said they would likely stay with their current veterinarian even if they moved 45 minutes away. These pet owners were more apt to be less educated

Table 5—Pet owners with dogs or cats who visited a veterinarian on the basis of stated reasons. Values based on 1,837 respondents.

	Dog		Cat	
Reasons	**%**	**± SE (%)**	**%**	**± SE (%)**
Vaccination	42	2.3	39	2.2
Routine examination	20	1.8	22	1.9
Illness	14	1.6	12	1.5
Injury	9	1.3	6	1.1
Spay or neuter	4	0.9	10	1.4
Dental care	1	0.5	2	0.6
Other	9	1.3	6	1.1

See Table 1 for key.

Table 6—Additional products and services received for dogs and cats during an appointment with a veterinarian.

Additional products and services	**For dogs (%)**	**For cats (%)**
Vaccines	14	16
Routine physical examination	8	7
Flea and tick control	13*	10
Heartworm prevention	14*	1
Pet food	2*	4
Total No. of respondents	**1,149**	**688**

See Table 1 for key.

(high school education or less), have no children under the age of 18 in the household, exhibit a strong owner-pet bond, and be less price sensitive.

Although most clients appear to be quite loyal, nearly 4 in 10 (38%) said they could easily switch veterinarians. Approximately a third (32%) of owners have used another veterinarian in addition to the one they use most often. Twenty percent of cat owners who have just 1 cat go to > 1 practice. Those with multiple pets, females, and college-educated owners were also more inclined to use multiple practices. Findings of the study underscore the lack of loyalty among some clients and the need to not take any client for granted.

Importance of the bond between a client and veterinarian—Findings of the study reveal that communication skills of a veterinarian are a key driver of a strong relationship between pet owners and their veterinarians. The bond between a client and veterinarian is defined as the tangible relationship between a pet owner and veterinarian as a result of the experience the pet owner has had with the veterinarian on the basis of the veterinarian's communication skills, interaction with pets, and ability to educate the owner about his or her pets' needs. The top indicators of a strong or weak relationship between pet owners and their veterinarian include the following:

- Amount of information a veterinarian provides about how to take care of pets.
- Communications with clients.
- Perception that veterinarian only sells clients things their pets need.
- Interaction with patients.

Clients who have favorable opinions about their veterinarians in these key areas have a strong relationship and are more loyal. They are also more likely to keep the same veterinarian even if they move 45 minutes away. And, they are less inclined to change veterinarians to get less expensive care. Most importantly, they are significantly more likely to do what their veterinarian recommends, regardless of cost.

By far, the most crucial component of a strong client-veterinarian bond is communication, which has a tremendous impact on the care pets receive. Clients who believe their veterinarian does a good job communicating and feel they receive enough pet-care information are more likely to have a strong bond with their veterinarian. Nearly 7 in 10 (69%) owners with a strong relationship with their veterinarian said they always follow recommendations of their veterinarian. Dog owners with a strong relationship with their veterinarian were significantly more likely to always follow the recommendations (84%) of their veterinarian, compared with those with a weak relationship (48%).

Importance of veterinarian communication on the care pets receive—Nearly all owners (98%) agreed that their veterinarian does an excellent job of interacting with their pets. However, this study included several questions to determine what role, if any, other forms of communication with the client might play in the quality of care pets receive.

Findings of the study revealed a direct link between how well the client perceived that a veterinarian communicated with their propensity to follow recommendations. Study results indicated that the cost of care was not a major obstacle in preventing most owners from following the advice of veterinarians. Instead, confusion, uncertainty, and misunderstanding played far greater roles in noncompliance.

A main reason (30%) owners cited for not following recommendations of their veterinarians was that they felt the recommended treatment was not necessary. With cat owners, almost half (47%) did not see the need to follow the orders of a veterinarian. Approximately 2 in 10 (19%) owners could not give a reason for not following the plan. Many clients may not have enough information to make the best decisions for their pet. It may be that pet owners do not grasp the importance or the value of the treatment. This uncertainty and lack of perceived value far outweighed concerns about cost.

Approximately 7 in 10 (71%) pet owners who believed their veterinarian did a good job communicating followed the orders of their veterinarians. That number decreased significantly (51%) for clients of veterinarians who were not good at communicating. This demonstrates that good communication can produce a 40% increase in clients who follow recommendations. The difference in compliance was even greater between clients who did not believe their veterinarians were trying to sell them unnecessary products or services versus those who did (Table 7).

Potential to improve the care pets receive—During the online portion of the study, respondents answered questions regarding the potential to purchase or receive various veterinary products and services. The results indicated that when prompted, approximately 90% of pet owners would seek 4 of the 5 items tested. These rates substantially surpass the current level at which these products and services are used or received.

When asked about receiving regular physical examinations for their pets, almost 9 in 10 (86%) dog owners and 8 in 10 (76%) cat owners had previously considered annual examinations. This finding demonstrates the substantial gap between pet owners who consider and those who actually receive examinations, especially among cat owners.

To assess the potential for owners to purchase or receive these products or services, respondents were

Table 7—Pet owners who said that they follow or do not follow veterinary recommendations in relationship to stated perceptions concerning their veterinarian. Values based on 1,836 respondents.

	Do not strongly agree and do not follow		Strongly agree and follow	
Perceptions	**%**	**± SE (%)**	**%**	**± SE (%)**
Excellent interaction with pet	49	2.3	71	2.1
Very good communicator	51	2.3	71	2.1
Does not sell unneeded products	47	2.3	76	2.0

See Table 1 for key.

initially asked if they had ever thought about getting any of the following:

- Heartworm medication.
- Flea and tick prevention.
- Preventive dental care.
- Vaccinations for various diseases.
- Regular physical examinations.

Pet owners who would seek preventive dental care increased 64% over those who had previously considered it. These results imply that if veterinarians introduce, recommend, and clearly explain the services, more owners would seriously consider and purchase them (Table 8).

Impact of Cost on Veterinary Care

Price-aware and price-sensitive pet owners—On the basis of common responses and attitudes regarding a group of variables, cluster analysis was used to place owners into homogeneous "price sensitivity" groups as follows: price unconscious (38%), price conscious (43%), and price sensitive (19%). Whereas price-unconscious owners are willing to obtain veterinary care at any cost without thinking about the price, those who are price conscious take price into account in their decisions. The price-conscious group was split about evenly between those pet owners who do and who do not always follow the advice of their veterinarian. Price-sensitive owners are more concerned about price and are not always able to afford veterinary care. Because the price-unconscious and price-conscious groups were similar and owners in both were likely to spend whatever it took to keep their pet healthy, the 2 groups were combined and discussed as a single "price-aware" group in this report. Most owners (81%) were "price aware," whereas the remainder (19%) were "price sensitive."

Although both types of owners (ie, price aware and price sensitive) were informed about the cost of care, owners in the price-aware group were more willing to spend whatever it took to keep their pets healthy. Although price-sensitive owners had a heightened level of concern about cost, approximately 2 of 3 (68%) were still willing to spend whatever it takes to keep their pet healthy. Price-aware owners gave higher priority to the veterinary care needs of their pet and were > 4 times as likely as price-sensitive owners to always do what their veterinarian recommended regardless of cost (49% vs 11%, respectively). Price-aware owners more often had strong relationships with their veterinarians, compared with price-sensitive owners (40% vs 18%, respectively). This may partially account for price-aware owners bringing their pets to veterinarians 31% more often than price-sensitive owners (mean of 2.1 visits/y vs 1.6 visits/y, respectively). Another important factor may be that price-aware owners had households with higher annual median incomes and fewer people to support on average than price-sensitive owners ($58,900 vs $48,000 and 2.9 vs 3.3 persons, respectively).

Compared with price-sensitive owners, price-aware owners were more likely to have the following characteristics:

- Shared responsibility for care of pet.
- Household without children.
- Annual household income > $40,000.
- Live in house.
- Strong owner-pet bond.
- Took pet to veterinarian in past year.

Compared with price-aware owners, price-sensitive owners were more likely to have the following characteristics:

- Female.
- Multiple pets.
- More pets.
- Paid nothing for ≥ 1 pet(s).
- Household with children.
- Live in multifamily unit.
- Not taken any pet(s) to veterinarian in past year.

How much owners would spend to save life of pet—Nearly 2 in 10 (17%) owners would spend any amount necessary to save the life of a pet, assuming the pet would recover and have a productive life. Price-aware owners were 2.5 times as likely as price-sensitive owners to make this claim (20% vs 8%, respectively). The mean amount that owners would spend (excluding outlier responses) was significantly higher for dogs ($2,021) than cats ($970). These amounts increased with income, with frequency of veterinary visits, and among owners who purchased their pets. However, regardless of household income, owners with a strong owner-pet bond would spend 3 times as much as owners with a weak owner-pet bond ($2,428 vs $820, respectively).

Perception of affordability and impact on veterinary care—Many owners agreed with the statement that "veterinary services are very expensive" (62%). Those who agreed most strongly with this statement were typically female and had annual incomes of < $40,000. Pet owners with a weak client-veterinarian bond were more

Table 8—Potential increases in the use of veterinary products and services on the basis of what owners had previously considered and what they would now seek.

Treatments	Had considered (%)	n	Would seek (%)	n
Vaccinations for various diseases	91	755	98	391
Regular physical examinations	82	755	95	351
Flea and tick prevention	81	755	93	470
Heartworm medication	64	755	89	397
Preventive dental care	45	755	74	480

n = Number of respondents that had considered or would seek each treatment, respectively, from which percentages are based.

likely than those with a strong bond to agree with the statement (73% vs 49%, respectively). Approximately 3 in 10 (29%) owners said they have been unable to afford veterinary services at one time or another. Because good communication drives clients' perceptions of value and their likelihood to follow recommendations, this finding reemphasizes the importance for veterinarians to clearly explain the reasons for various treatments. Pet owners who claimed a lack of affordability had the following characteristics:

- At least 1 dog and cat.
- Did not pay for pet.
- Household with children.
- Annual household income of < $40,000.
- Weak client-veterinarian bond.
- Price sensitive.

Pet owners who get advance price quotes on veterinary care—The perceived cost of veterinary care probably plays a role in why approximately half (49%) of pet owners said they always get a price quote before deciding on veterinary care. Households with children and lower annual incomes (< $40,000 vs ≥ $80,000) were more inclined to get pricing information in advance. Dog owners with weak owner-pet bonds or weak client-veterinarian bonds more often asked about prices, compared with dog owners with strong owner-pet bonds or strong client-veterinarian bonds (52% vs 43% and 56% vs 39%, respectively). Price-sensitive owners inquired about cost at nearly 2 times the rate of owners who were price aware (79% vs 43%, respectively).

Price Shop By Telephone

Fifteen percent of pet owners said they always or frequently call a veterinarian to find out how much products and services will cost. Owners who price shop by phone typically have the following characteristics:

- Multiple pets.
- Household with children.
- Annual household income of < $40,000.
- Weak client-veterinarian bond.
- Price sensitive.

Price Shop By Internet

Slightly > 1 in 10 (12%) pet owners said they always or frequently use the Internet to inquire about veterinary-care–related pricing. Most (61%) pet owners have never used the Internet to inquire about veterinary-care–related pricing. Those most likely to price shop on the Internet for pet-care services and products often had the following characteristics:

- Multiple pets.
- Dog-only households.
- Paid for ≥ 1 pet(s).
- Dog owners with strong client-veterinarian bond.
- Price sensitive.
- College or advance degree.
- Annual household income of ≥ $80,000.

Price Shopping by Product and Service

The top 3 products and services for which owners sought advance price quotes by use of the phone and Internet are typically considered commodities (Table 9). However, not all pet owners viewed these strictly as commodities. In several instances, they perceived that veterinarians provide additional value to the products or services and they preferred to obtain them directly from veterinarians, even at a higher cost.

Medical decisions based on more than price—Less than half (48%) of pet owners agreed that, when possible, they would choose low-cost veterinary care. Cat owners were significantly more likely than dog owners to agree (53% vs 44%, respectively). The typical pet owner who would choose low-cost care had the following characteristics:

- Household with children.
- Annual household income of < $40,000.
- Female.
- Weak owner-pet or client-veterinarian bonds.

The importance of a client-veterinarian bond is demonstrated by the fact that, overall, 70% of pet owners said they would stay with their veterinarian even if another practice had lower prices. This percentage increased to 89% for owners with a strong client-veterinarian bond. Owners who were more likely to stay with their veterinarian had the following characteristics:

- Dog owner.
- Male.
- Household without children.
- Annual household income of ≥ $40,000.
- Price aware.
- Strong owner-pet bond.

Demand for Products and Services

Overview—Pet owners completed an online conjoint survey in which they were presented alternative configurations of 6 products and services (vaccines, heartworm medication, flea and tick treatment, preventive dental care, neutering, and routine physical examination). They were asked how likely they would be to purchase each alternative. Demand curves were derived that show the percentage of owners who would buy each configuration at various price points.

Demand curves of the percentage of owners who would buy each of the products and services versus various prices all had a similar shape. All had a steep slope at lower prices and flattened out near the mid-price range. This flattening or "long tail" is indicative of price indifference, suggesting that many pet owners would be willing to obtain necessary treatment regardless of price.

Table 9—Top 3 veterinary products and services that owners comparison price shopped for by telephone or the Internet.

Products and services	On phone (%)	On Internet (%)
Vaccines	35	NA
Spay and neuter	27	NA
Flea and tick control	16	39
Pet food	NA	19
Toys	NA	18
Total No. of respondents	**1,112**	**773**

NA = Not applicable because not 1 of top 3 products or services shopped for by telephone or the Internet.

Owners prefer buying directly from veterinary practices—Results of the conjoint analysis suggested that owners would rather take their pet to a full-service practice for vaccinations, heartworm medication, flea and tick treatment, and spaying or neutering than obtain products and services from a lower cost channel such as Internet sites, vaccination vans, or spay-neuter clinics. For each scenario, at every price point, the percentage of owners who would buy was highest for options purchased directly from veterinary practices. In addition, at every level of demand, the price owners would be willing to pay was highest when the products or services were provided by veterinarians.

Awareness and education can increase perceived value and demand—Some pet owners appeared confused when presented with a multitude of physical examination options that they may not have fully understood. When shown options that were not explained, some pet owners chose to stick to "the basics," choosing to pay more for annual physical examinations that included fewer services. By doing a better job explaining the value of thorough examination procedures and tests, veterinarians should be able to increase the quality of care provided and their practice revenues.

Frequency of service—Over time, the pet-care industry has educated most owners that dogs and cats should get an examination at least once a year, if not twice (**Figure 1**). The success of this educational effort is reflected in the demand curve for examinations where demand was highest for annual examinations than for other options. Targeting pet owners who do not have a college degree or have an annual household income of < $40,000 present the biggest opportunity for increasing visit frequency to twice yearly.

In conrast, many owners were not aware that their pets should receive regular dental care. In the study, pet owners often chose dental care options that had the lowest visit frequency (ie, evaluation once every 4 years; **Figure 2**). In reality, few owners bring their pets in at all for dental care. Therefore, getting more owners to bring their pets in even infrequently would be an improvement. Because lowering prices would likely have little impact on encouraging more frequent or additional preventive dental visits, the industry and veterinarians should continue to concentrate their efforts on educating pet owners about the benefits of annual dental cleanings and twice yearly physical examinations.

Evaluation of blood work before surgery—For preventive dental care and spaying or neutering, pet owners were more likely to choose an option that included hematologic and biochemical analyses before surgery, even at higher price points. These findings suggest an opportunity to consistently include blood work-up before surgery, not just offer it as an option.

Pain management before, during, and after spaying or neutering—In the conjoint analysis, owners consistently chose spay or neuter configurations that included administration of pain medications before, during, and after the procedures over configurations that did not feature pain control. They were, however, less enthusiastic when it came to administering medications for pain at home following surgery. These findings emphasize the importance of always including pain medications before, during, and after surgery. It is critical to clearly communicate to pet owners to assure them that their pets will not feel pain while in the hospital.

Demand for products and services was higher for dogs than for cats—The conjoint analysis confirmed that pet owners were more likely to purchase veterinary products and services for dogs than cats. The biggest gaps for the products and services tested were for heartworm medication, examinations, and vaccines.

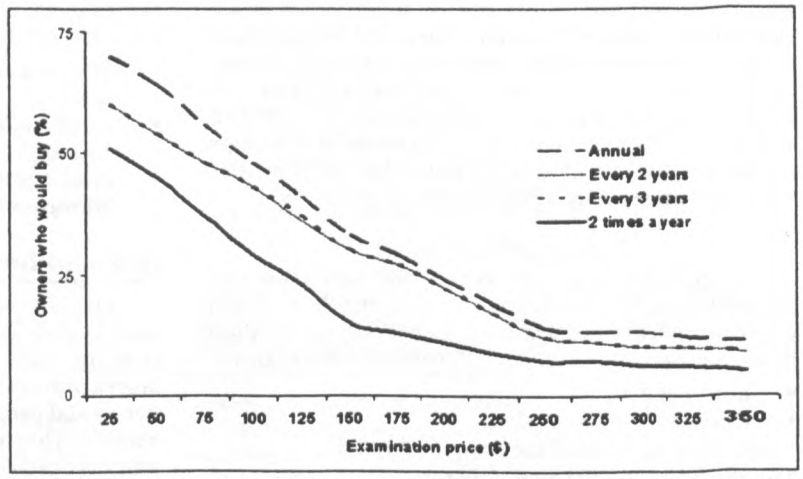

Figure 1—Demand curves of the percentage of owners who would pay for routine examinations annually, every 2 years, every 3 years, and 2 times a year at various price points.

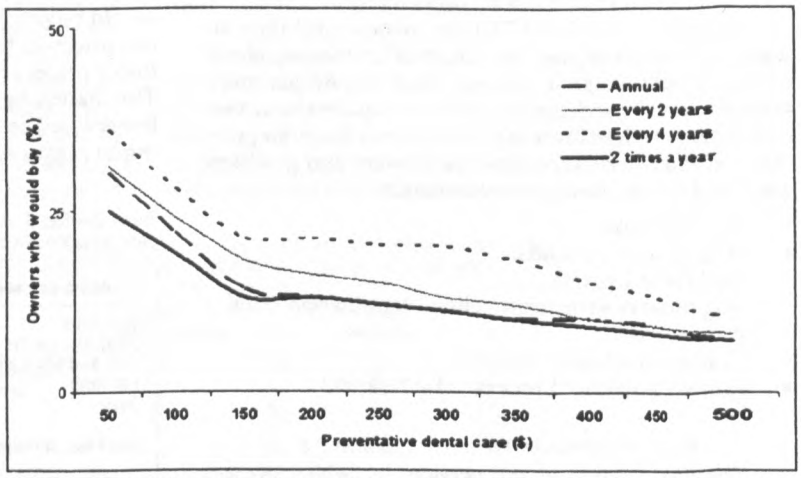

Figure 2—Demand curves of the percentage of owners who would pay for preventative dental care annually, every 2 years, every 4 years, and 2 times a year at various price points.

Increasing pet-owner awareness and understanding of the value of veterinary services for all pets would help towards closing the gap in care, especially for cats.

Conclusions and Recommendations

- Owners with the strongest bond with pets took their pets to veterinarians more often, were more likely to follow veterinarian recommendations regardless of cost, and were more likely to seek preventive care for their pets. Care decisions were not necessarily made on the basis of the income of clients but rather on their attachment to their pets and their understanding of the importance and value of the recommendations of their veterinarians. A veterinarian should recognize owner behaviors or feedback that indicate a weak or strong owner-pet bond to better understand the unique situation of each client and how it impacts the care pets receive.
- Cats were substantially underserved, compared with dogs. This was likely the result of the lack of owner attachment and understanding of the care cats should receive. However, cat owners often were more educated than dog owners and with the proper communication from a veterinarian may be more likely to seek increased services, including regular physical examinations, parasite prevention, and preventive dental care. This highlights the opportunity for veterinarians to substantially increase overall care for cats by making more thorough explanations and recommendations to owners regarding the benefits to pets.
- Findings of the study also revealed that cats from households with dogs and cats were seen by veterinarians significantly less often than dogs from these same households. Veterinarians can increase the care all pets in a household receive by acquiring more knowledge about the total pet makeup of the household and recommending a plan for each pet.
- Pet owners with the strongest client-veterinarian bond were the most loyal and more likely to follow recommendations. However, nearly 40% of pet owners said they could easily switch veterinarians, which points to a high level of vulnerability for many practices. The key factor for maintaining a strong client-veterinarian bond was communication, including thorough explanations and recommendations, which increased the perception that veterinarians only sell to clients the things their pets need.
- Findings from this study uncovered the preferences of pet owners to obtain products and services from full-service practices versus alternative channels such as Internet sites, mail, or low-cost clinics. Furthermore, they were willing to pay more if the product or service was provided by veterinarians.
- It was not the price of care that prevented most clients from undertaking recommended treatments. Only 2 in 10 clients said they were apt to decline care because they could not afford it. The real problem with owner compliance was confusion, uncertainty, and misunderstanding. A main reason cited by owners for not following recommendations was that they did not feel the recommended treatment was necessary, underscoring the need for better explanations regarding treatment benefits.
- Overall, these study findings revealed that clear and thorough veterinarian communication with the client could ultimately increase compliance by as much as 40%.

Virulent Systemic Feline Calicivirus Update

Virulent Systemic Feline Calicivirus Update

Feline caliciviruses (FCVs) are highly prevalent, important pathogens of cats. Most FCV isolates primarily infect epithelial cells of the oral, nasal, and conjunctival mucosae causing vesicular lesions on the tongue and/or nasal philtrum, and signs of mild upper respiratory tract disease; more virulent isolates are reported to cause pneumonia by infecting type II pneumocytes. However, in the last eight to ten years there have been multiple sporadic reports of a highly virulent systemic disease caused by FCV (VS-FCV). VS-FCV infections are extremely contagious and cause high morbidity and mortality; findings include non-responsive fever, pancreatitis, disseminated intravascular coagulation, hepatic necrosis, limb and facial edema, and skin and footpad ulceration.

This lecture will provide up to date information about the clinical and pathological features of VS-FCV disease and provide some insights into the origins of this disease. In addition, we will discuss the difficulties in diagnosis and management of outbreaks.

An important point to make is that there is no diagnostic test that can distinguish VS-FCV isolates from other FCV isolates. As FCV in certain feline populations can be highly prevalent, care must be taken in diagnosis. I will discuss the difficulties for researchers in studying this disease and discuss our recent findings about VS-FCV and FCV in general.